AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

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P12

JUNE 1957

Precision Metal Molding

PMM

INCLUDING DIE CASTINGS MAGAZINE

DIE CASTINGS

INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

POWDER METALLURGY

SHELL MOLD CASTINGS

"Investment castings answer many parts problems for the small manufac[illegible]"

L. H. Fitch,
Fitch Instruments, Inc.
see page 3

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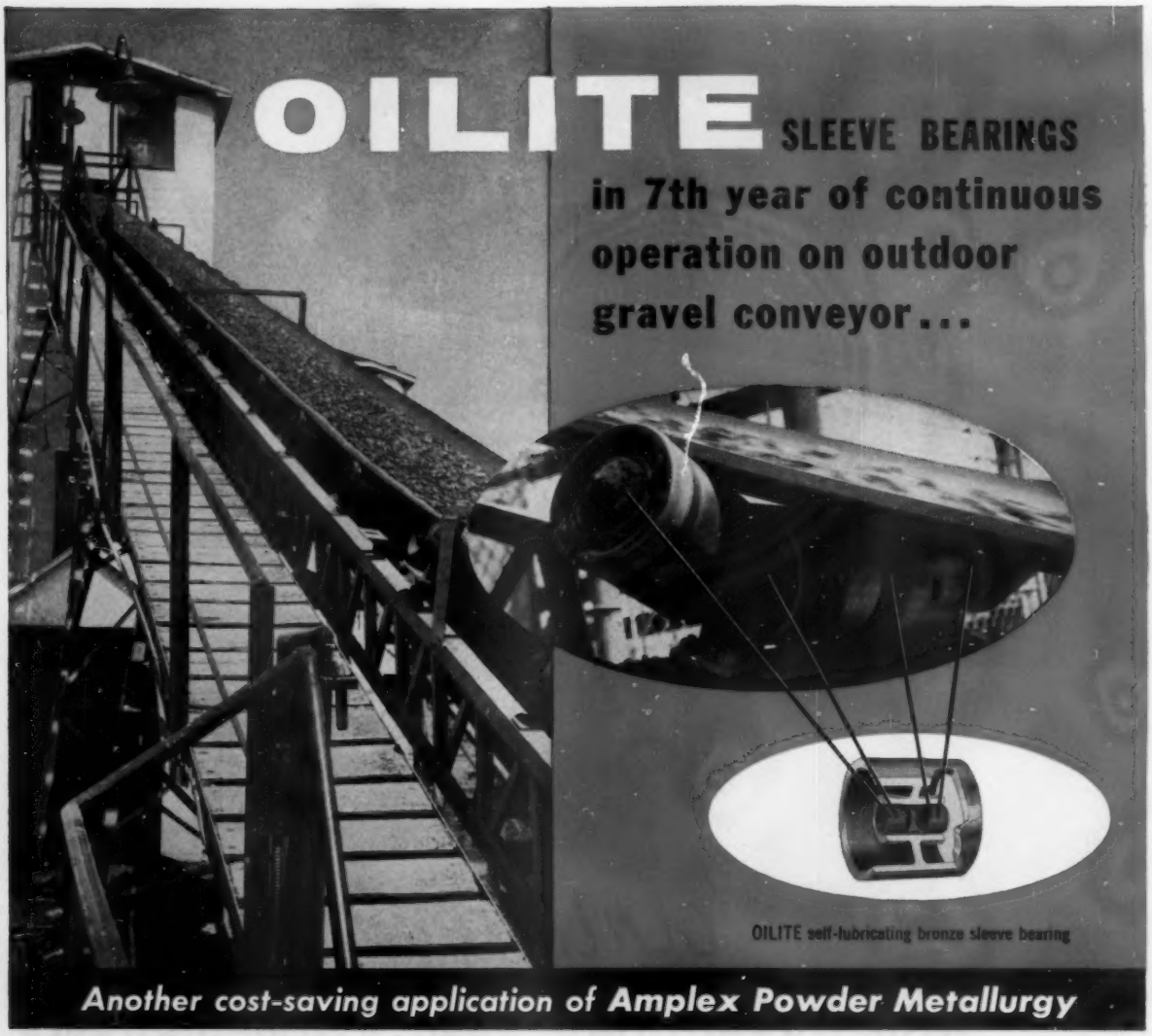
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in 7th year of continuous operation on outdoor gravel conveyor...
OILITE self-lubricating bronze sleeve bearing
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That's some record! J. Cooke (Concrete Blocks) Ltd., of Aldershot, Ontario, one of Canada's largest producers of concrete blocks, operating twenty of these sand and gravel conveyors, has proved the long wearing, money saving qualities of OILITE bearings.

No wonder all twenty conveyors are 100% OILITE equipped. The company says, "We wouldn't use any other kind."

What interests you? Longer product life—greater efficiency—lower cost? All three? Maybe Amplex has the answer.

Write for detailed information about Amplex powder metal components—OILITE Bearings, Parts, Filters. Or call your nearest engineering representative listed in the yellow pages under "Bearings—OILITE."

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PMM **IN THIS ISSUE** June 1957: Volume 15 Number 6

COVER STORY

BRONZE INVESTMENT CASTINGS are used in the Trigulator, a mechanical device used to solve problems in both trigonometry and geometry. According to L. H. Fitch of the Fitch Instrument Corp. "Investment castings are the answer to many parts problems. This is especially true of the small manufacturer who always has an inventory problem. Most small manufacturer's rates do not lend themselves to economical, mass purchases or processing of raw materials." See page 36.

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36 **INSTRUMENT MAKER SOLVES PRODUCTION PROBLEMS**
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In many meters a cold rolled steel ring is used as a return magnetic path. Now these rings can be made from iron powder to give better results at lower costs.

45 **SHELL MOLD CASTING SOLVES CORE PROBLEM**
Complex coring is easily done and high accuracy held by using shell molds and resin bonded cores.

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BETWEEN THE LINES

the editor's viewpoint on articles in current and forthcoming issues

AN IMPORTANT FACTOR IN FIGURING COST of die castings is the number of shots you can make per hour. One way to arrive at this figure is to make an estimate based on previous experience with comparable castings. This can be extremely risky and difficult. Now, a system has been devised by an experienced die caster for estimating output per hour. He has agreed to share his findings, based on many years of die casting practice, with PMM's readers. His calculations appear in this issue starting on page 106.

STANDARD COMMERCIAL PRACTICES TO FOLLOW IN BUYING DIE CASTINGS is the subject of an article beginning on page 38 of this issue. Buyers and sellers of castings follow certain traditional patterns of negotiation and agreement, and this article sets down the basic practices now in use. The article is based on a set of commercial standards just completed by the American Die Casting Institute, and published here as a service to PMM's readers.

YOUR INVESTMENT CASTING SUPER-MARKET is contained in this issue, starting on page 73. It is the 2nd annual Investment Casting Directory, containing complete listings of sources for investment castings, equipment, materials and alloys. We have had a large number of extra copies printed to meet the expected demand, since last year's Directory was sold out before the ink was dry.

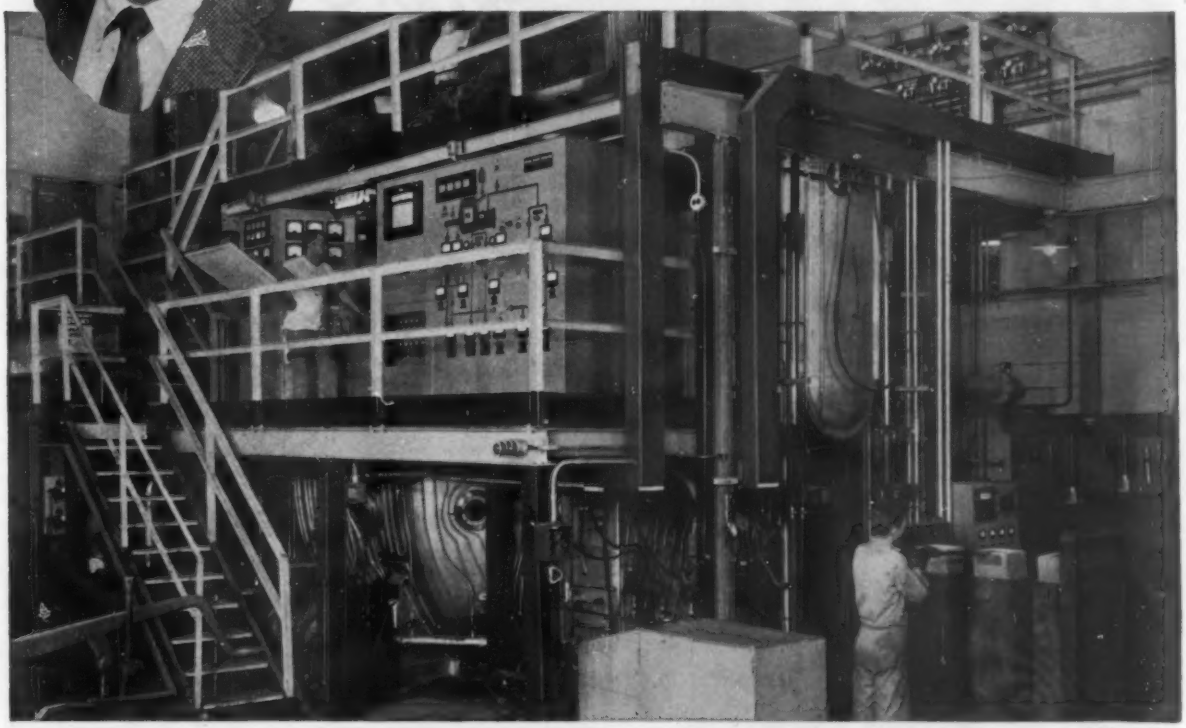
A SIGNIFICANT ADVANCE IN INSTRUMENT MANUFACTURE is brought to light in this issue of PMM with an article describing new magnetic-return-path rings now being made of iron powder. Always before made from cold rolled steel, engineers at Simpson Electric searched for an improved method of manufacture and came up with production from iron powder. The steps in their investigation and the details of the successful results are recounted beginning on page 43.

A ROSE BY ANY OTHER NAME would smell as sweet, the old saying goes, but this is definitely not true of industrial processes where mistaken identity or erroneous nomenclature can end up disastrously. One industry in need of standardized nomenclature has been the barrel finishing industry. The techniques of barrel finishing have evolved from the old-fashioned tumbling methods, now very accurately controlled to get precise finishing results. The various terms used in barrel finishing have been the subject of misinterpretation in the past, so, with the cooperation of all major manufacturers of barrel equipment and supplies, PMM has compiled a complete glossary of barrel finishing nomenclature. We'll publish it in July.

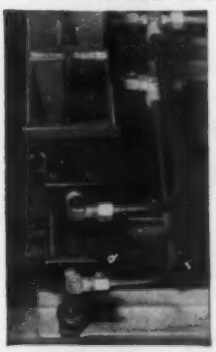
SOME DOLLAR-AND-CENTS RESULTS coming from mechanizing a permanent mold and sand foundry will also be offered in July. Flow chart, before-and-after figures, and technical details of the experience of a California company will be included in July.

"Our experience demonstrated that hydraulic line rupture can occur in proximity to molten metal without fire when Cellulubes are used . . ."

Mr. Arthur E. Franks of Vacuum Metals Corporation, Syracuse, N.Y.



". . . this is why fire-resistant Celanese Cellulube hydraulic fluid is in use in the world's largest vacuum furnace at Vacuum Metals Corporation."



Hydraulic Controls on the world's largest vacuum furnace

In designing the hydraulic controls for its 2500-pound vacuum melting furnace, Vacuum Metals selected Cellulube hydraulic fluid because of its fire resistance and low vapor pressure characteristics. Laboratory tests and operating experience demonstrated that the unique combination of Cellulubes' properties made it the ideal material for this application.

These findings are typical of Cellulubes' performance during continuous operation under critical conditions. As hydraulic fluids, Cellulubes reduce the dangers of fires and explosions caused by line breaks or other equipment failures. As air cylinder lubricants, Cellulubes prevent the formation of excessive carbon deposits—the main source of compressor fires and explosions.

Available in 6 controlled viscosities, Cellulubes can be supplied to meet exacting requirements in the replacement of flammable fluids presently in use. Play it safe, write for complete data and technical assistance. Celanese Corporation of America, Chemical Division, Dept. 589-F 180 Madison Ave., N. Y. 16.

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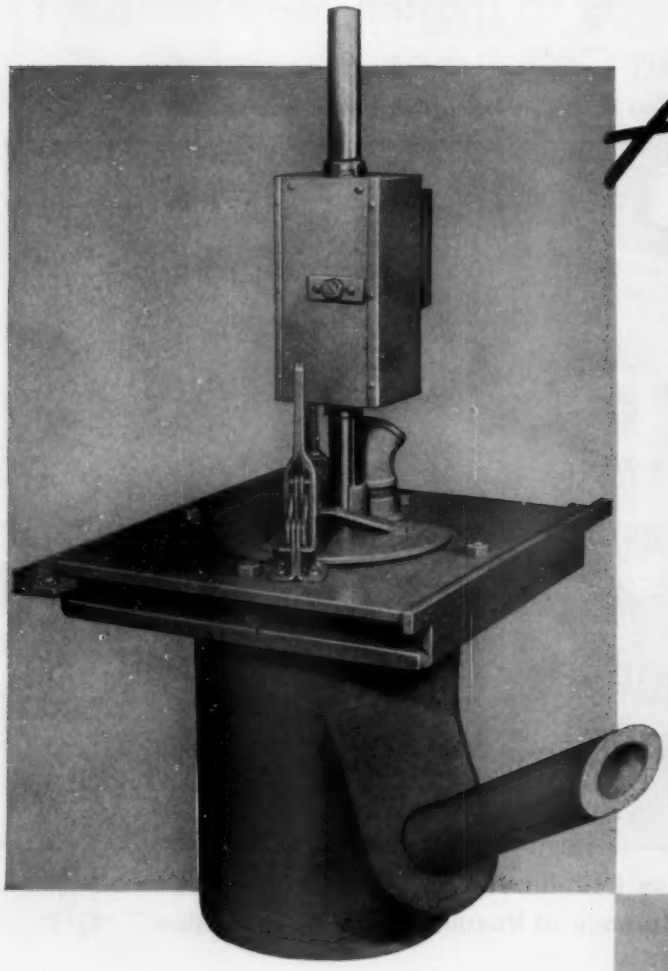
Automatic casting of Aluminum *now practical*

with *New* LINDBERG-FISHER

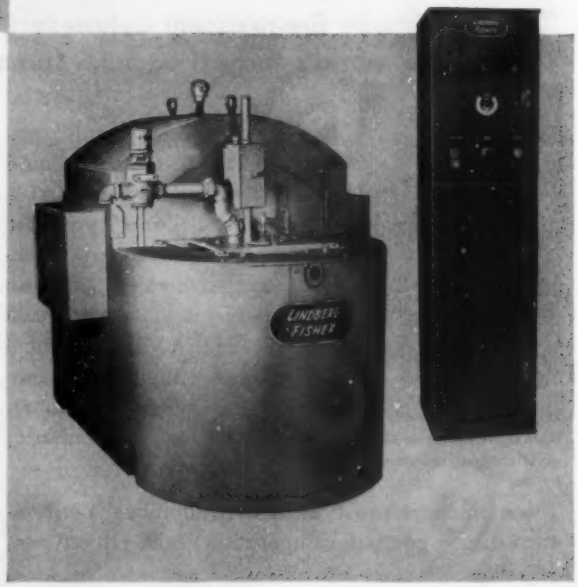
We call it "LITTLE JOE"



Autoladle

To the best of our knowledge the Autoladle is the first practical automatic aluminum ladling unit yet devised. Thoroughly tested and proven in service, the Autoladle is adaptable to induction, electric resistance or fuel fired reverberatory furnaces. In any installation it offers these advantages:

- Ladled metal is withdrawn from beneath surface of bath.
- Precise, accurate control of any size shot up to 30 lbs.
- No interruption of the casting cycle during charging of metal.
- No variation of size of shot due to metal level changes.
- Composed of special refractory materials so arranged that ladled metal cannot come in contact with any metal.



At the right, "Little Joe" is shown installed in a Lindberg-Fisher electric resistance aluminum holding furnace. With it is the panel cubicle and controls which is supplied completely assembled and wired. For complete information on the Autoladle get in touch with your nearest Lindberg Field Representative (See your classified phone book) or write us direct.

LINDBERG FISHER

A Division of Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois

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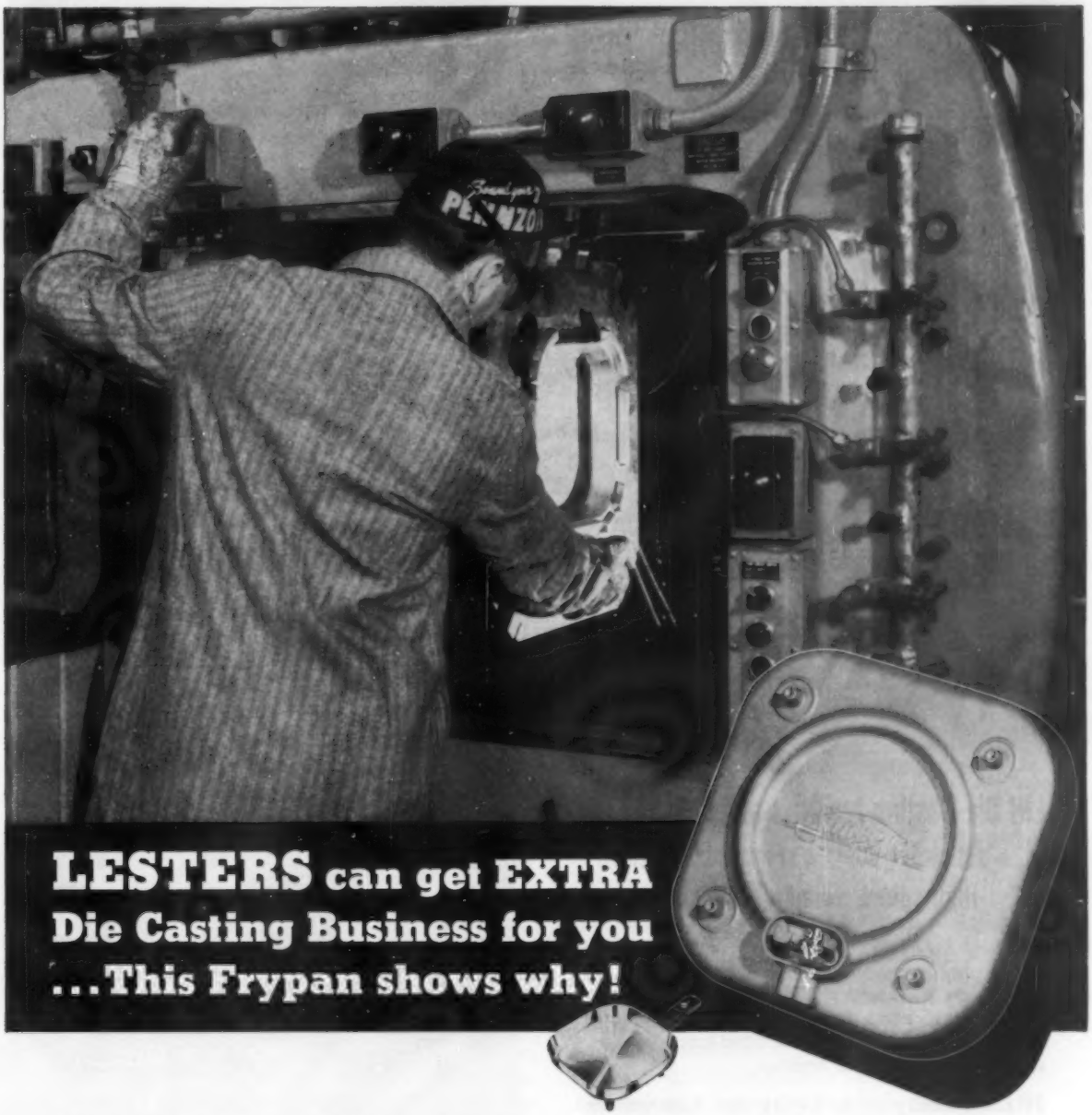

LESTERS can get EXTRA Die Casting Business for you ...This Frypan shows why!

Specifications: 121 square inches, heating element insert, absolute non-porosity to resist frying temperatures, and flawless finish. And to top it off, it had to be cast with No. 360 prime alloy, to provide the finest non-corrosive utensil. As you know, it's one of the toughest alloys to cast.

Nevertheless, Meta-Mold Aluminum Company in Cedarburg, Wisconsin, working exclusively on Lester machines, has been supplying Sunbeam Corporation with such fine parts for their automatic Frypan, that they have extended the life of the die from a normal 30,000 shots to an amazing 100,000 shots. Besides, secondary finishing costs have been cut to the bone.

Sunbeam Corporation has been so very impressed and pleased that they have ordered Lesters for their own plants, to assist in the production of the product.

Here's the clincher. Meta-Mold has been die casting for less than two years and has been out-performing more experienced vendors who don't use Lester machines.

Complete machine specifications available in Bulletin 101. WRITE TODAY.

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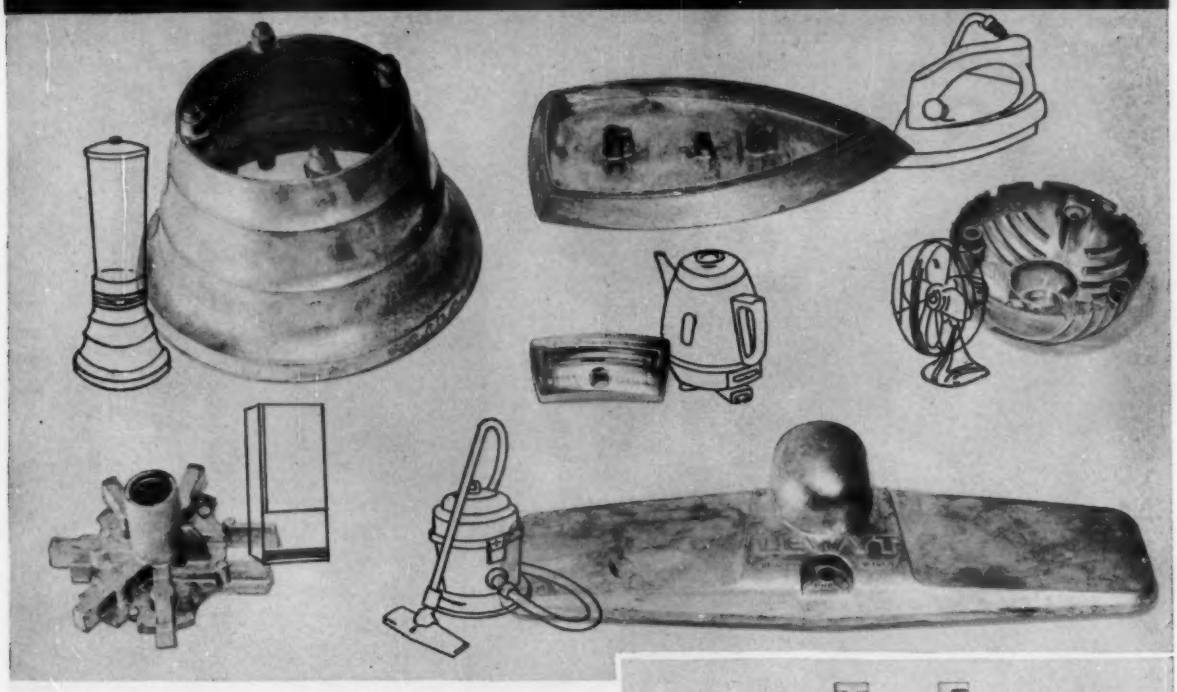
HOME APPLIANCE PARTS



DOLLIN Die-Casting facilities and methods assure

Lowest cost • Fine quality
High-speed, volume production
Dependable delivery

DOLLIN has produced millions of aluminum and zinc die-cast parts for leading home appliance manufacturers in almost unlimited sizes, designs, shapes, intricacies and finishes.

DOLLIN is ideally set up for low-cost, high-volume production of die-cast appliance parts . . . from original drawing to delivery of complete parts ready for assembly. Extensive facilities include the most modern equipment for large aluminum and zinc castings, as well as specially-designed, high-speed, fully automatic machines for small zinc castings. Complete engineering, die-making and machining services available. Choice of chrome, brass or gold plating, painting, lacquering or other finish desired.

For cost-cutting suggestions, quotations and engineering advice, submit drawings or samples of your parts, without obligation.

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for Better Parts with c d f Iron Powders

QC is the accepted symbol throughout industry for QUALITY CONTROL. To us it has an even greater significance. In Republic Iron Powders, QC stands for QUALITY and CONFIDENCE.

QC means that Republic Iron Powders are of the highest QUALITY. QC means that you can use Republic Iron Powders for your parts fabrication with complete CONFIDENCE because the powders are uniformly CONSISTENT in lot after lot.

Republic's preparation process and special qualities of the base material, from which Republic Iron Powders are made, assure this uniform consistency. Particle-size distribution and apparent density are carefully controlled. Acceptable limits on flow rate, hydrogen loss and chemical analysis have been established.

These facts plus Republic's exclusive *Controlled Dimensional Factor* iron powders can help you make better parts, reduce fabricating costs, save on expensive die re-working. Our engineers will help you without obligation. Just mail the coupon.

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these 3 fine steels

cover the entire range of your light metal die and plastic mold requirements

HOTFORM—the nationally known hot work steel for aluminum, magnesium and white metal die casting—withstands erosion, resists fire-checking, and air hardens from a relatively low temperature without excessive scaling. This steel can be exposed to working temperatures up to 1000° without softening. It is highly resistant to thermal shock, and combines strength with toughness.

Hotform

SPEED-CUT is a free-machining die steel furnished heat treated ready for use as die casting dies for white metal alloys, plastic mold plates, die shoes, backing plates and many other applications. Its alloy content is sufficient to produce hardnesses of 275 to 325 Brinell for sizes as large as 20" x 10" on cooling in still air—machining very readily at such hardness.

Speed Cut

MC (Mold and Cavity steel) is provided heat treated and ready for use for plastic mold cavities, die casting dies and a wide range of other uses where a highly polished finish is desirable. MC is a medium carbon-alloy steel with very deep hardening qualities. It is painstakingly produced to avoid sulphides and other non-metallic inclusions, permitting high polish in plastic mold cavities without pits or blemish.

MC

Vanadium-Alloys Steel Company

LATROBE, PENNSYLVANIA

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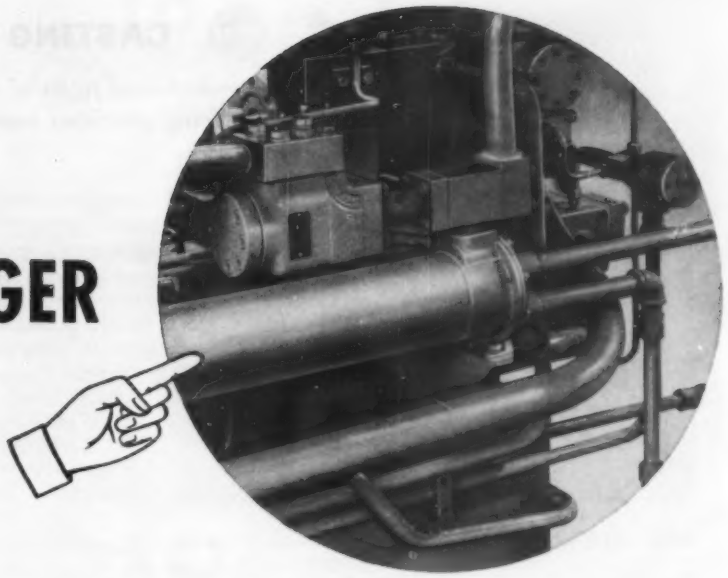
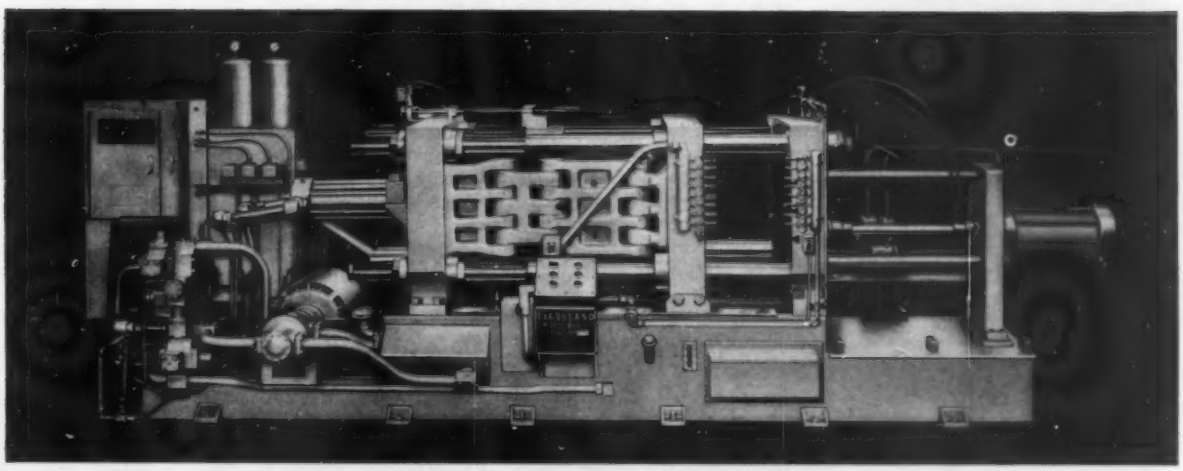
ROSS EXCHANGER



a built-in feature to insure full locking pressure



Cleveland Die Casting Machine with 600-ton locking pressure delivers precision-quality zinc castings up to 25 lbs.

"True locking pressure," says Cleveland Automatic Machine Company, "is as important in a die casting machine as accuracy in a machine tool or horsepower in a motor or engine. It determines whether or not the machine is able to safely withstand the high injection pressures necessary to produce sound, dense castings."

To insure full locking pressure of the die caster pictured above, Cleveland has installed a Ross Type BCF Exchanger as an important component of the hydraulic power system. Uniform temperature of the fluid is maintained at all times to prevent pump slippage and pressure variations caused by overheated, thinned oil.

Because of their record for ruggedness and thermal efficiency, Ross Exchangers are regularly furnished with extrusion and metal drawing presses, die casting machines, powdered metal presses, injection and compression molding machines, and numerous other types of hydraulic equipment.

Pre-engineered and fully standardized, they're available in a wide range of sizes to meet most heat transfer requirements. Bulletin 1.1K5 will give you detailed information. Write to Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER

Division of AMERICAN-Standard

For more information circle No. 76 on the Reader Service Card

CASTING ABOUT

technical news of applications & processes involving precision metal moldings

SPECIAL STAINLESS STEEL CASTINGS have helped a manufacturer of paper-making equipment to lick two big problems of corrosion and erosion in the machinery that makes pulp from all species of wood. A special alloy called Pandaloy is being used by the Black-Clawson Company to meet the attack of cooking liquors used to break down wood fibers and to resist abrasive action of dirt and sand. The special feed screws used in this machinery are cast by the Buffalo Foundry of Allegheny Ludlum Steel Corp. Weight of each feed screw is 508 pounds. Their size: 54″ long x 9″ in diameter.

ADD A NEW WORD to your vocabulary. "Pyrogenics", according to the Industrial Bulletin published by Arthur D. Little, Inc., denotes research in the uncharted area of high temperatures approaching those of the sun. One of many techniques mentioned is the continuous melting of metal powders gradually pushed into the electromagnetic field inside a high frequency coil. Levitation and solar furnaces are other approaches to the testing of materials in the range between 3000 C and 6000 C.

POROUS SHEET METAL is one of the new materials available for aeronautical and other purposes. The material is a continuous sintered sheet of felted metal fibers based on the "Fiber Metallurgy" techniques developed at Armour Research Foundation of Illinois Institute of Technology.

Possible uses: high temperature filters for aircraft engines, a honeycomb structure to fill rudder and tail sections, a porous material for transpiration cooling systems, and for aircraft "boundary layer" control. Boundary layer control is a method of reducing turbulence of air movements over airfoil surfaces by passing air through a layer of porous material where turbulence is present.

Characteristics: Porosity can range from 94 percent to less than 1 percent. The 94 percent porous material is still self supporting and has some stiffness. Bronzes, carbon and stainless steels and certain high temperature alloys are being considered for fiber purposes.

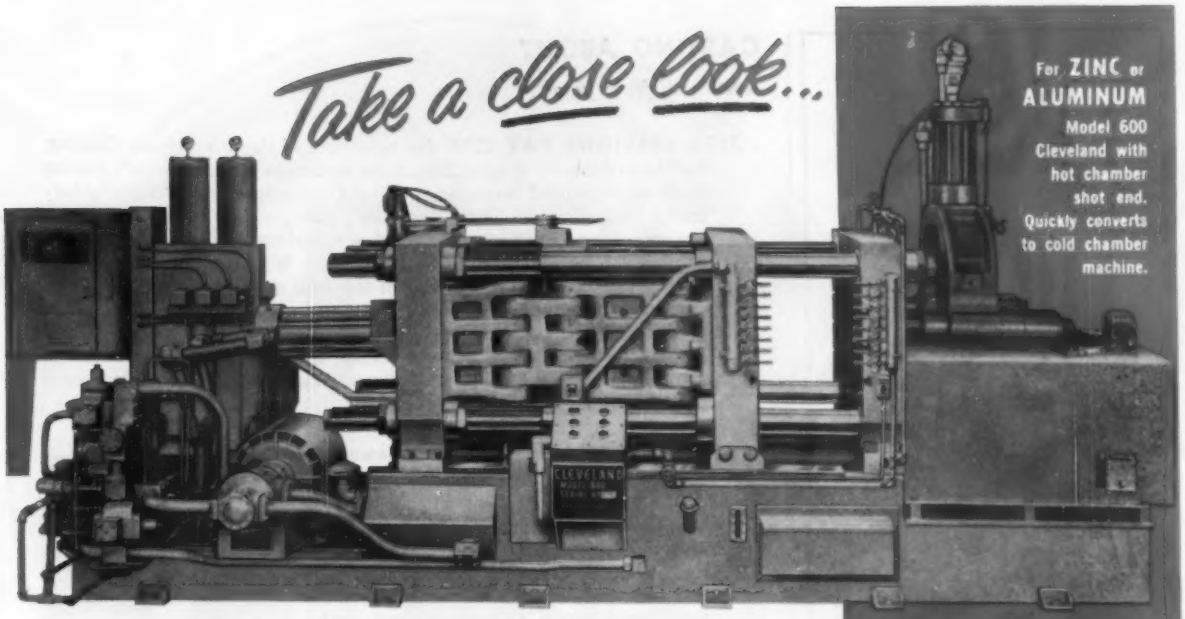
YOU CAN PUT YOUR FOOT DOWN on this new die cast aluminum stair tread designed to give safer footing for industrial workers while cutting down on long-term maintenance costs. Placed on the market by Aluminum Company of America, the die cast tread utilizes a slip-proof abrasive nosing. Because the grating is die cast in one piece, concentrated loads are distributed more evenly over the bearing bars. Although designed to carry the weight of a heavy man, the stair has withstood loads in excess of 3,000 pounds. Deflection and permanent set have been less than in comparable conventional treads.

This stair tread is said to answer the need for a step which requires no protective coatings. The aluminum alloy is corrosion resistant. In addition, the die casting has been designed with radiused corners which do not collect dirt. Stair lengths range from 24 to 42″.

Three classes of finish are available: "As Fabricated" finish for standard structural purposes, with the die casting simply trimmed to within 1/32″; "Polished Finish" for sanitary stairways such as in dairies, in which the castings are belt sanded, hand polished and clear lacquered; and "Marine Finish" for shipboard applications, using anodized surface covered with a thin coat of aluminum paint.

Continued on page 14

Take a close look...



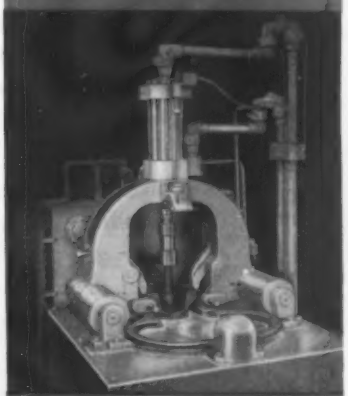
For **ZINC** or **ALUMINUM** Model 600 Cleveland with hot chamber shot end. Quickly converts to cold chamber machine.

at the new model 600 CLEVELAND

Cleveland's Model 600 brings to die casters a major advancement in die casting machine design. Its dozens of highly important features—many are exclusively Cleveland's — insure exceptional performance in delivering castings of precision quality at a fast production rate.

The "600" is *massive*—with guaranteed 600-tons locking pressure (strain gage tested). Maximum weight of shot is 10 lbs. aluminum and 25.8 lbs. zinc. It has 46½" x 46" die plates; 28" x 28" space between the tie bars; 30" max. to 10" min. die thickness; 8" to 15" die opening.

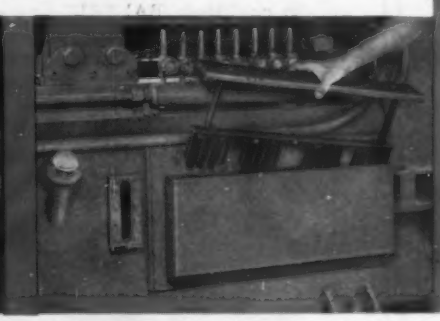
Only a few "600" features are illustrated here, but these are typical of Cleveland's all-over quality construction. For full details, call in a Cleveland sales engineer and write for new Bulletin 600.



New hot chamber shot end. Improved cast steel shot cylinder and gooseneck supports permit quick gooseneck removal. High pressure swivel joints in hydraulic lines.

Plus: Automatic timing controls separate from machine, with push buttons convenient for operator's control . . . heavy, one-piece, machine-length base . . . extra rugged platens and toggles . . . dual accumulator system . . . manifold hydraulics . . . automatic lubrication . . . many other important construction features.

30 hp. totally enclosed motor drives two Vickers pumps which deliver 99.7 gal. per min. The 200 gal. hydraulic reservoir has filter capacity twice the pump capacity.



Magnet assemblies in hydraulic return line reservoir remove any metallic particles from the fluid. Adjustable bronze wedge supports for moving platen.

REMEMBER,
Clevelands Cut Costs!

THE CLEVELAND AUTOMATIC MACHINE COMPANY

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With the opening of our permanently staffed Rome office we are now able to give marketing help to American manufacturers who are interested in any of the above three areas.

We opened our Italian office because that country offers unusual profit opportunities for American manufacturers and without the usual foreign currency limitations. The Italian government makes it very attractive to American manufacturers who will open certain types of plants in specified locations.

Such manufacturers get favorable tax consideration and are able, under most circumstances, to take their profits out of Italy with minimal limitations.

Drop us a note if you're interested. Att: Irving B. Hexter.

The Industrial Publishing Corporation

812 Huron Road Cleveland 15, Ohio

CASTING ABOUT

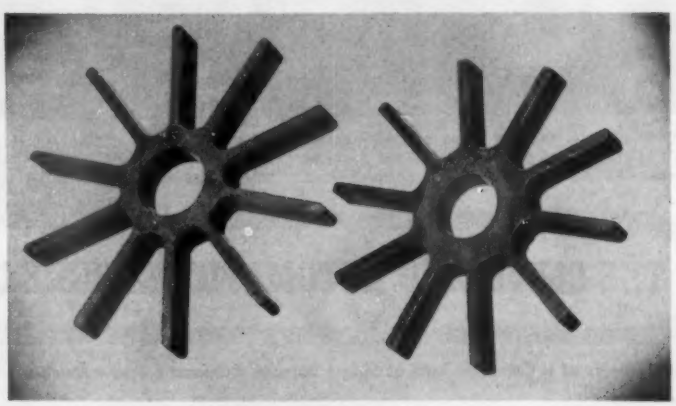
continued from page 12

BULL SESSIONS PAY OFF for members of the Investment Casting Institute. Instead of spending their evenings "on the town" during their semi-annual business meetings, members settle down informally to organized "Bull Sessions", the general topics for which are announced well in advance. Are members interested? You bet! During the recent sessions of the ICI in Washington, the oversize hotel room chosen for the site of the bull sessions was crowded to overflowing with investment casters who wanted to discuss plant layout problems, obstacles to making larger castings, analysis of defective castings, and plastic versus wax patterns. Two evenings were devoted to these informal discussions in which members tossed their ideas back and forth freely. Both evenings were sell-outs.

STAINLESS STEEL WHALES were awarded to two men by the Investment Casting Institute at their Spring meeting in Washington last month. Robert R. Miller, president of Precision Metalsmiths, Inc., and Irving B. Hexter, president of Industrial Publishing Corporation, were given the investment cast whale as a symbol of having done "a whale of a job for the investment casting industry". The whales, cast in a stainless alloy and mounted on rosewood blocks, were presented by K. W. Thompson and V. S. Lazzara, president and past president respectively of the ICI. Miller's award was made for his direction of the publication of the new ICI "Engineering and Design Manual". The award to Hexter was made in recognition of the part played by PRECISION METAL MOLDING magazine in the early stages of the ICI organization, and its continuing support of ICI activities.

Irving B. Hexter

CONVERSION TO ZINC DIE CASTINGS from aluminum sand castings in the production of motor fans has made it possible for Baldor Electric Company of St. Louis to reduce material and labor costs as much as 61 percent and speed up production. The fan is used to cool their BALTRIC line of electric motors. Superior balance, minimizing of secondary operations and closer tolerances are said to be gained by the redesign. The shaft hole of the fan and the set screw hole are cored to finished size. Only finishing operations: trim the perimeter and tap the set screw hole. Previously, the shaft hole had to be bored, set screw hole drilled and tapped, gates and fins carefully removed and ground. The zinc castings are produced for Baldor by A. B. Mueller Co. of St. Louis.



HPM

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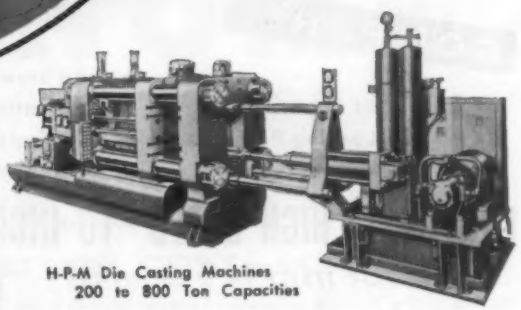
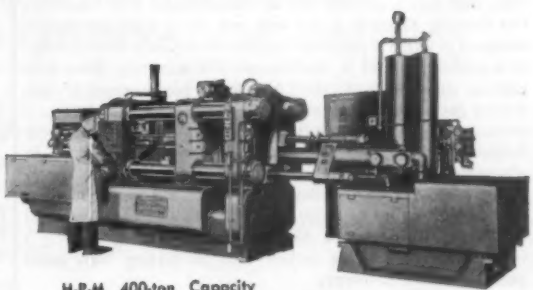


H-P-M Die Casting Machines
200 to 800 Ton Capacities



H-P-M 400-ton Capacity
Die Casting Press

Unlike many anniversaries that are built to exaggerated proportions, H-P-M is entering its eighty-first year with a minimum of interest in the past. Instead our research and development have geared our efforts to a program for the future. We like to feel that throughout our long and varied experience we have learned to anticipate the needs of the many industries with which we work. It is their future that guides our planning and our policies for the days ahead. This thinking has traditionally guided H-P-M to its present position as a leader in the hydraulic industry. Our goals will be changed only to provide more and better service to the industries we serve.

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COMPLETE—READY TO RUN

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OPERATING COST 17 1/2¢ PER HR. for Gas & Electricity

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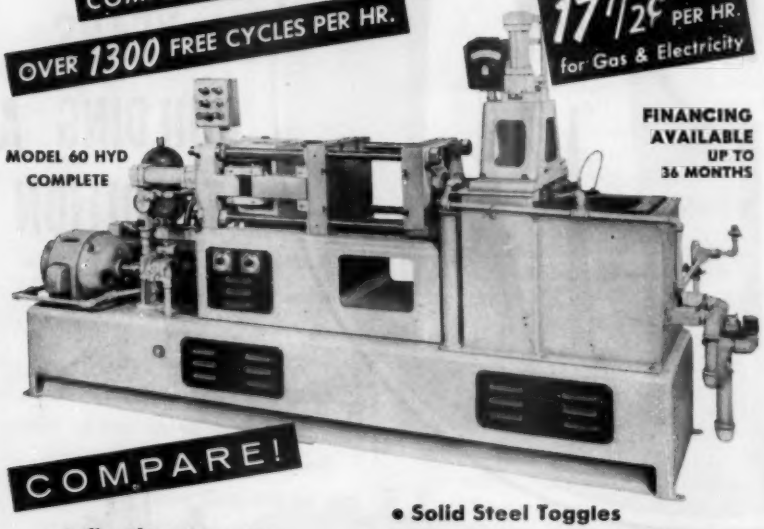
MODEL 60 HYD COMPLETE



COMPARE!

- 3 lb. Shot Capacity
- 80-Ton Locking Pressure
- 17¾" Platens
- Solid Steel Toggles
- Automatic Electric Cycling
- Blast Type Furnace Blowers
- All Steel Welded Construction

LOW COST • HIGH SPEED • TO INCREASE PROFITS

PAYS FOR ITSELF IN 6 MONTHS!

Get big casting machine performance engineered into a low cost, high speed, quality unit in one package! The American Die Casting Machine is the only one of its kind specifically designed as either a complete supplementary item for big shops or a production unit in small shops. For accuracy, density of casting, superior finish, the "American" has a record of producing premium quality castings (1 oz. up to 3 lbs.) of any intricate design. You get uniformity so that machining or finishing costs are either reduced to an absolute minimum or eliminated entirely. Time studies show the "American" operates 8 hours per day—5 days a week—at a mass-production, cost-cutting figure of only 17½c PER HOUR for gas and electricity. Furthermore, the large size die platens (17¾") have far more working surface area for greater high speed production and economy.

Available in Air or Hydraulically operated plunger gooseneck type for zinc, tin or lead, or, cold chamber type for aluminum, brass and magnesium.

TYPICAL EXAMPLE:
WINDOW HARDWARE...
ONLY 4½¢ per set of 3

Quality hardware-finish castings with a 6-cavity die. Can you duplicate this amazing performance with your present die casting equipment?

FREE ENGINEERING SERVICE

We will help install your American Die Casting Machine—train one of your men as an operator—start you producing high speed quality castings.

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STANDARD EQUIPMENT COMPONENTS

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For more information circle No. 7 on the Reader Service Card

PMM LETTERS

the readers' forum

ZINC CASTINGS

We believe the May issue of your magazine is one of the best yet for service to your readers.

However, we do take exception to one thing in the permanent mold section. Zinc as a permanent mold metal is very lightly passed over, whereas when extreme detail, dimensional accuracy, sound internal structure or weight is desired, zinc, in one of the special alloys, can do a real job.

We believe there are many applications for zinc permanent mold castings that are not now recognized. C.M.P., president.

From time to time, PRECISION METAL MOLDING has published articles on zinc permanent mold castings. We have invited C.M.P. to prepare another article to be published in the near future. Ed.

WHERE TO BUY

Enclosed are preliminary prints of two parts on which we think some kind of precision casting could better solve our problem than machining a sand casting, our present approved method.

As you can see, there are only two sets of surfaces where tolerance is important; of these the most important is that the surfaces of the Vee shall receive a cylinder without it rocking. If we can obtain this feature in a casting the expensive milling operation can be omitted. The remaining machining operations would then be inexpensive.

Quantity of the first order will be for 1700 of each; future orders are likely to be smaller.

Can you advise us promptly where to inquire? Or shall we send you extra prints for your inquiry on our behalf? What kind of casting is appropriate to this need? Delivery of the castings within six weeks is desired. E.C.F., president.

Desired information sent. Ed.

I saw an interesting item on page 12 of your April 1957 issue. This dealt with "Casting Full-Size Cermet Turbine Blades" at one of the flight propulsion laboratories.

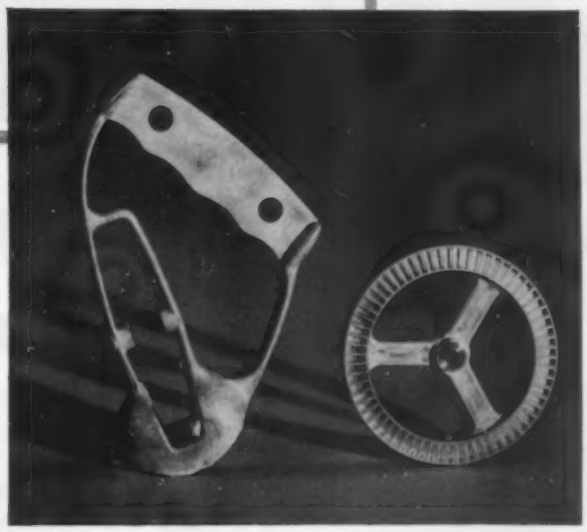
The item mentioned drying by

Continued on page 24

There's a Good Reason why

ZINC DIE CASTINGS

are so widely used



at

TURNER & SEYMOUR

it's

ECONOMY

Two-piece construction instead of six for the frame, gear housing, shield and drive gear on this modern egg beater is an excellent pattern for major production economy and improved design possible with ZINC DIE CASTING. Built to a toolmaker's precision, this durable and smooth-running household necessity is made by The Turner & Seymour Manufacturing Company.

LOWER PRODUCTION COST—An assembly of stampings, used for older types of beaters, require six or eight parts instead of the two ready-to-use ZINC DIE CASTINGS.

SIMPLIFIED ASSEMBLY—The gear housing and cored holes for crank, beater shafts and gears are cast in the frame. Parts fit together accurately for simple assembly without machining.

IMPROVED APPEARANCE—The flowing, modern design and smooth finish of the castings provide a perfect base for a bright chromium plating accented by black plastic handle faces.

Any die caster will show you how these money-saving and quality-improving benefits can be applied to your products.

THE NEW JERSEY ZINC COMPANY 160 Front Street, New York 38, N. Y.

The research was done and the Zamak die casting alloys were developed with

HORSE HEAD SPECIAL (99.99 + % Uniform Quality)

ZINC

FOR DIE CASTING ALLOYS

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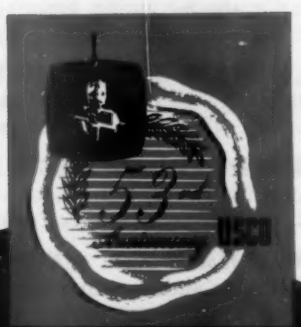
USCO K-Z

USCO K-Z Aluminum Die-Casting Alloy is a high zinc variation of the popular USCO K (AXS-679 Revision 3) with zinc up to 2%. USCO K-Z is growing in popularity because the higher zinc content gives better machinability and castability while the mechanical and physical properties remain the same as USCO K.

USCO K-Z, like all other USCO Aluminum Alloys, is production and quantometric controlled from raw materials to finished ingot under the most modern methods of alloying.

If you desire, USCO K-Z can be tailor-made to fit your specific needs. For a lower cost aluminum die-casting alloy, order USCO K-Z!



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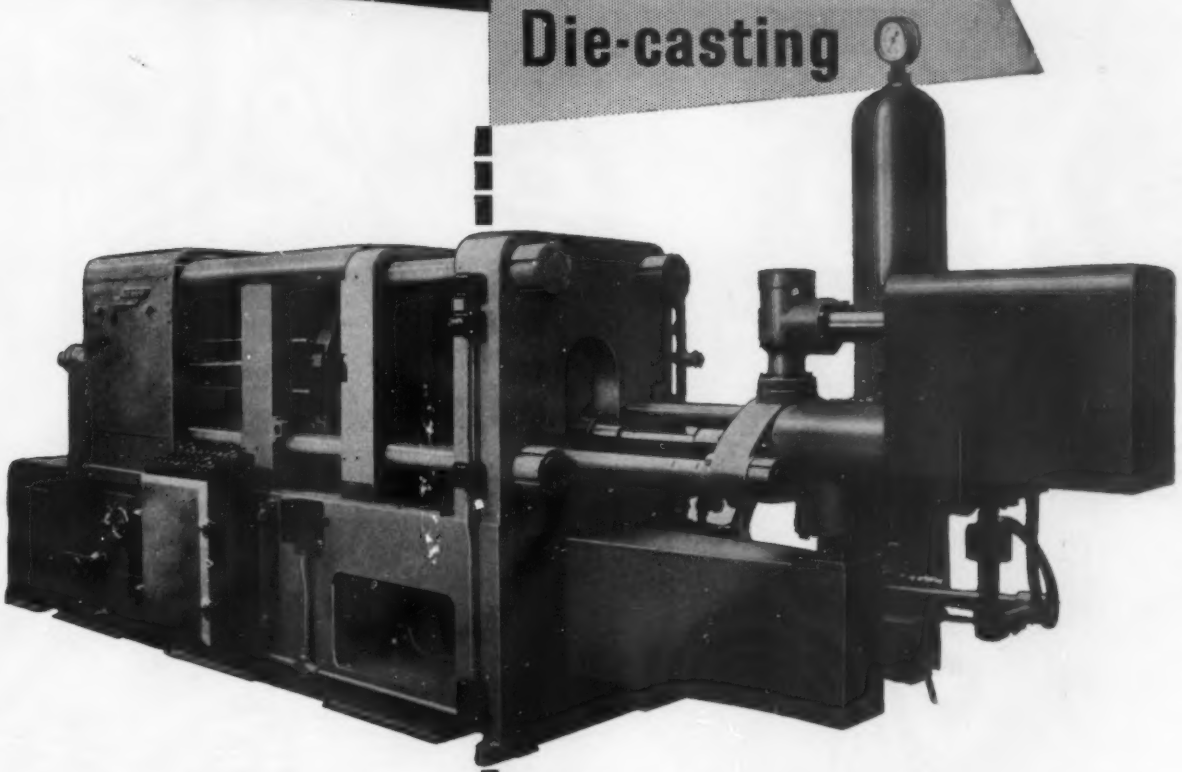
Die-casting



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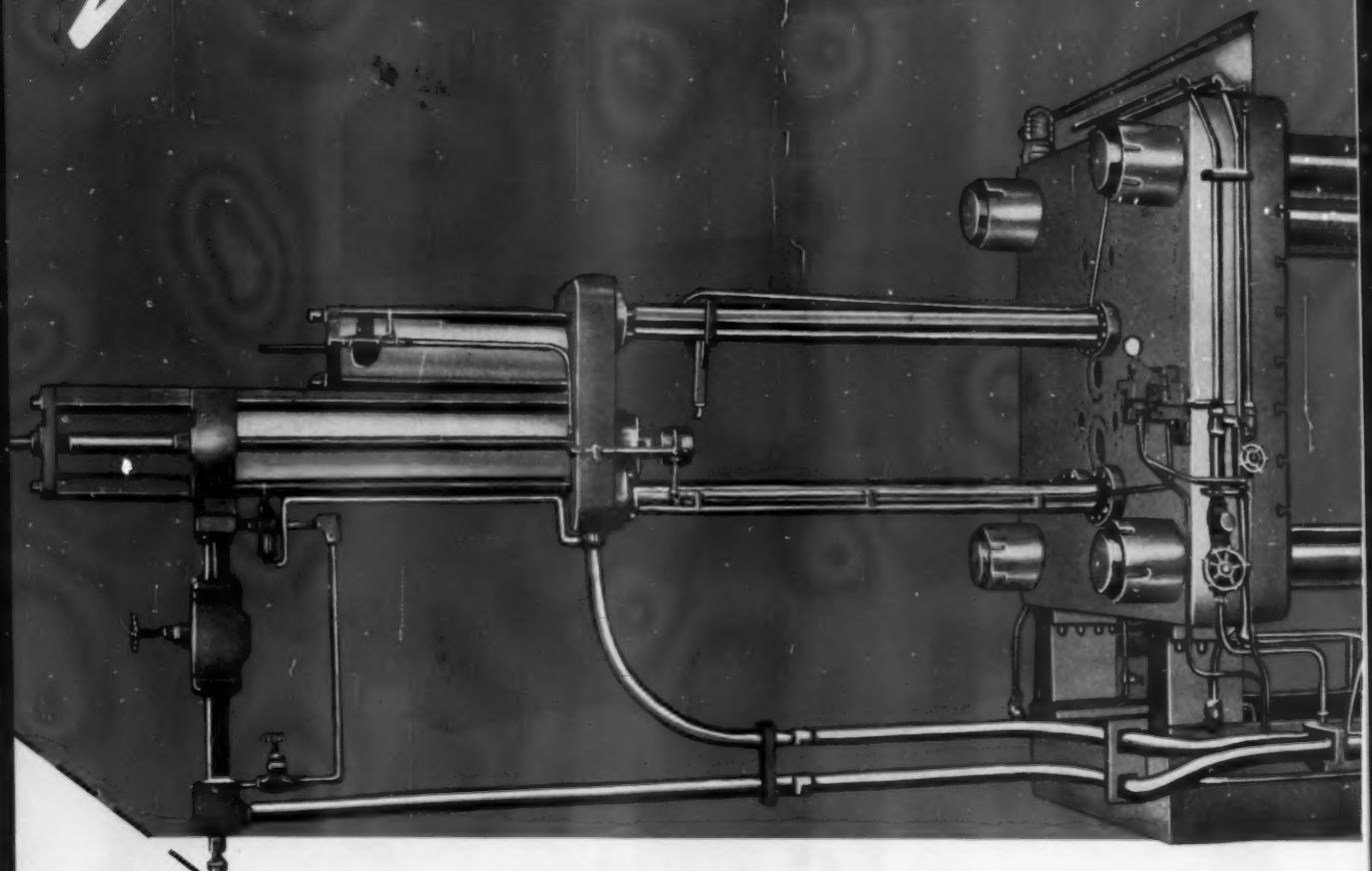
Introduces THE WORLD'S LARGEST..

☆ **PRODUCES ALUMINUM CASTINGS UP TO 75 POUNDS**



Clip and Mail this Coupon

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CAST-MASTER INC.
23901 Aurora Rd. • Bedford, O

Please send me items checked:

☐ Please send specification sheet on Cast-Master Model B-70-A

☐ Please send brochure illustrating other Cast-Master models

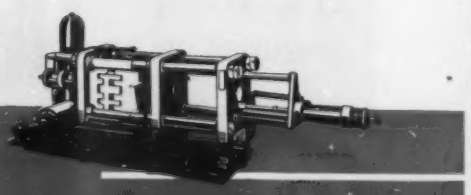
Name of Company

Address Zone State

Attention

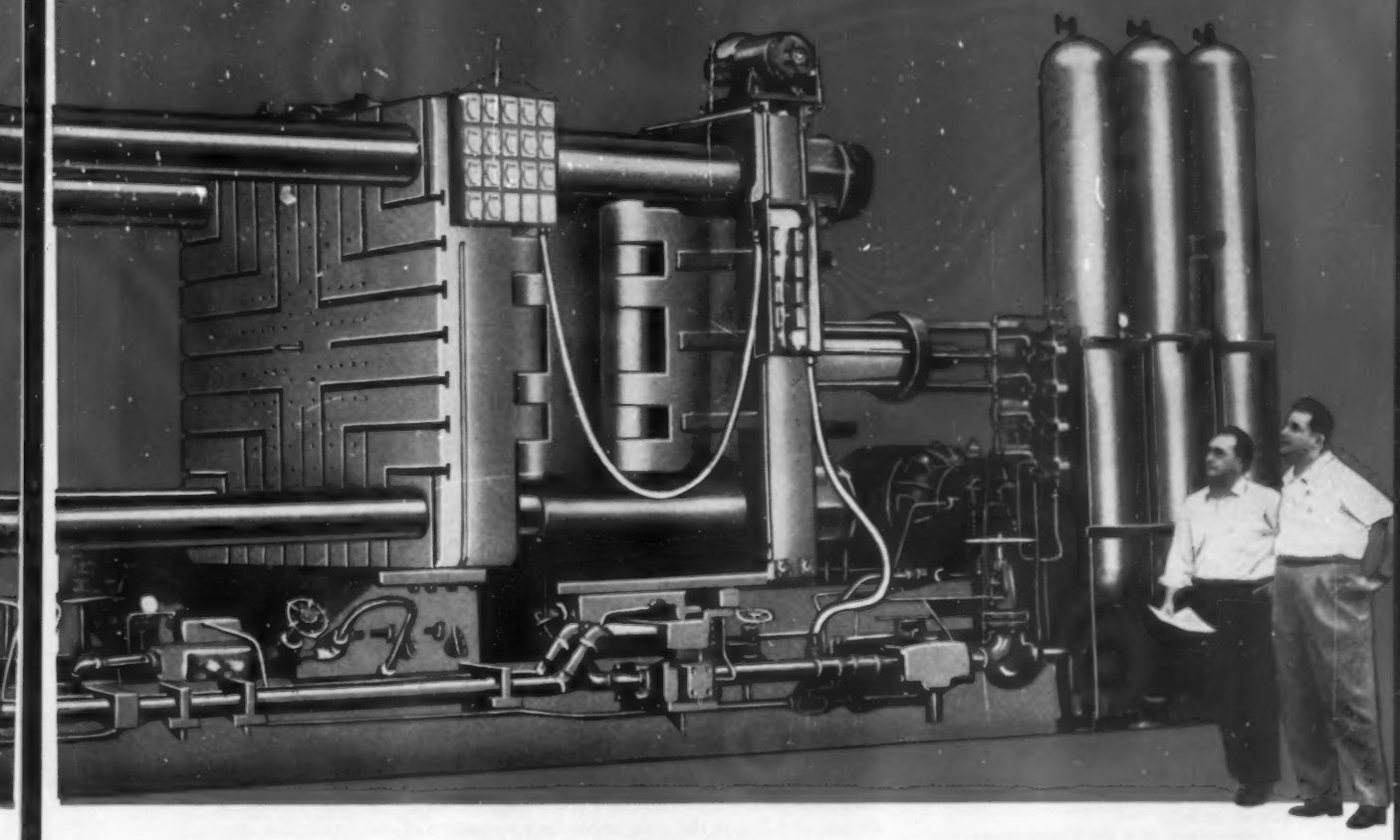
For more information circle No. 22 on the Reader Service Card

☆ **WHETHER YOUR DIE-CASTING MACHINE REQUIREMENTS ARE BIG OR SMALL, SIMPLE OR COMPLEX, OUR DESIGN ENGINEERS HAVE THE SKILL AND KNOW-HOW TO COPE WITH ANY PROBLEMS EFFICIENTLY.**



. . Commercially-built DIE-CASTING MACHINE!

☆ OPERATES AT SAME CYCLIC SPEED AS SMALLER MODELS

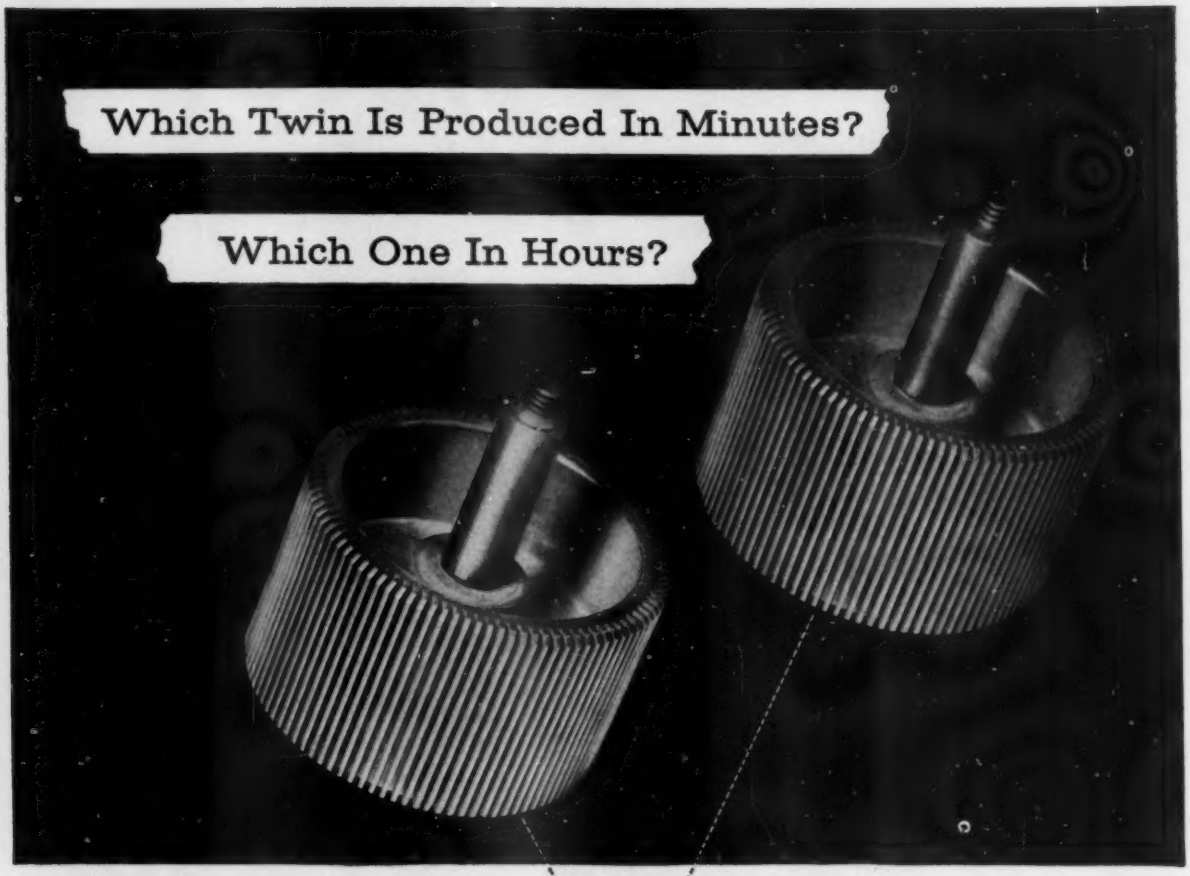


To meet the growing demand for machines that are capable of turning out larger and larger castings we are proud to announce the completion of the Model B-70-A Cast-Master. It embodies all of the outstanding features that are common to the Cast-Master line plus several new engineering achievements. With the Model B-70-A, it is possible to die cast extra large castings more efficiently and more economically than ever before . . . opening up a completely new market to the die-casting industry.

Eastern Representative:
Milton Harmon, 18 Rock Rd., Milford, Connecticut

Midwest Representative:
C. W. Stone Co., Minneapolis 3, Minnesota

CAST-MASTER *Inc.* 23901 AURORA ROAD, Bedford, Ohio



These parts are identical. One, however, is produced in minutes, the other in hours. Parker-engineered die casting makes the difference.

Formerly, this part (shown left above) was machined from the solid. The threaded steel shank was inserted in a separate operation. Numbers on the face (not shown) had to be stamped . . . still another operation. *Total production time per piece was measured in hours.*

Now, this same part, including the steel insert and the face numbers, is produced as a unit by Parker-engineered die casting. Trimming of gate and fins is the only secondary operation. *Total production time per piece is now measured in minutes.*

Here is just another example of the way Parker-engineered die castings save you money.

This skill and experience can solve problems—and save money—on *your* components parts. Just call the nearest Parker sales engineer or write the factory direct.

PARKER SALES ENGINEERS

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CHICAGO 49, Ill.
Ollie J. Berger Company • 2059 East 72 Street

CINCINNATI 14, Ohio
William H. Broxterman • 2430 Central Parkway

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Daniel F. Marsh • 35 Chestnut Street

KIRKWOOD 22, MO.
Edward F. Higgins, Jr. • 102 West Adams Street

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PARKER

high pressure ALUMINUM and ZINC die castings
POWDERED METAL PARTS

For more information circle No. 67 on the Reader Service Card

Smoother Cruising **with EVINRUDE'S new quiet-power motor**

Horsepower UP—weight DOWN! Shell molded crankshaft for 35 H.P. Big-Twin Evinrude outboard motor. Crankshaft is produced by using sand coated with Plenco #371

Smoother Production **with rugged new improved crankshaft**

shell molded with Plenco resins

Formerly a steel forging, Evinrude crankshafts are now a steel casting made by the shell molding process. Savings have proved to be two-fold: (1) The larger castings are delivered to the machine shop for less than the former purchase price of the forgings; (2) several machining operations have been eliminated entirely. An additional benefit has been a saving of up to 35% in weight; the forged crankshaft weighed 12 pounds, while the one shell molded with the help of Plenco resins weighs only 8 pounds.

The cast crankshafts have resulted in quality equal or better than the former forgings. Too, a long lead time is no longer necessary as the shell molding operation can be closely coordinated with machine shop requirements. Life of the shell pattern is obviously much greater than a forging die.

Naturally, many resins were evaluated by Evinrude for an operation of this magnitude. We are pleased that Plenco 371 was selected. Shell molding is one of the manufacturing methods utilized by long-experienced Evinrude of Milwaukee to increase horsepower 40% in the last several years. Shouldn't you check the advantages of shell molding?

PLENCO PHENOLICS
FOR BETTER PLASTIC PRODUCTS

PLASTICS ENGINEERING COMPANY Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

For more information circle No. 70 on the Reader Service Card

UCON Hydrolubes
spell
SAFETY
This new booklet . . .
. . . tells you how CARBIDE's UCON Brand hydrolubes spell safety for you, your plant, and your employees.
Yes, industrial experience over a period of more than 10 years has shown that the common fire hazards connected with hydraulic operations are eliminated when UCON hydrolubes are used. So, why not find out how the fire-resistance, outstanding anti-wear characteristics, and corrosion protection of new and improved UCON hydrolube "CP"-type fluids can help spell safety for you. Write for "Ucon Hydrolubes Spell Safety," Form 40134.
CARBIDE
CHEMICALS
CARBIDE AND CARBON CHEMICALS COMPANY
30 East 42nd Street New York 17, New York
"Ucon" is a registered trade-mark of Union Carbide
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LETTERS

continued from page 16

sublimation. This is one of our activities, and I wonder if you could tell us where this work is going on, so that we might try to find more information. W.E.R.

PLEASE ADD

I have recently had an opportunity to read your magazine and enjoyed it very much.

I understand that for readers who qualify, this magazine will be sent free of charge. It is felt that this publication would be of considerable use in our Purchasing Engineering Section in the development of new sources for castings and molded parts, as well as for material substitutions. Our major product is guided missiles and associated handling and test equipment.

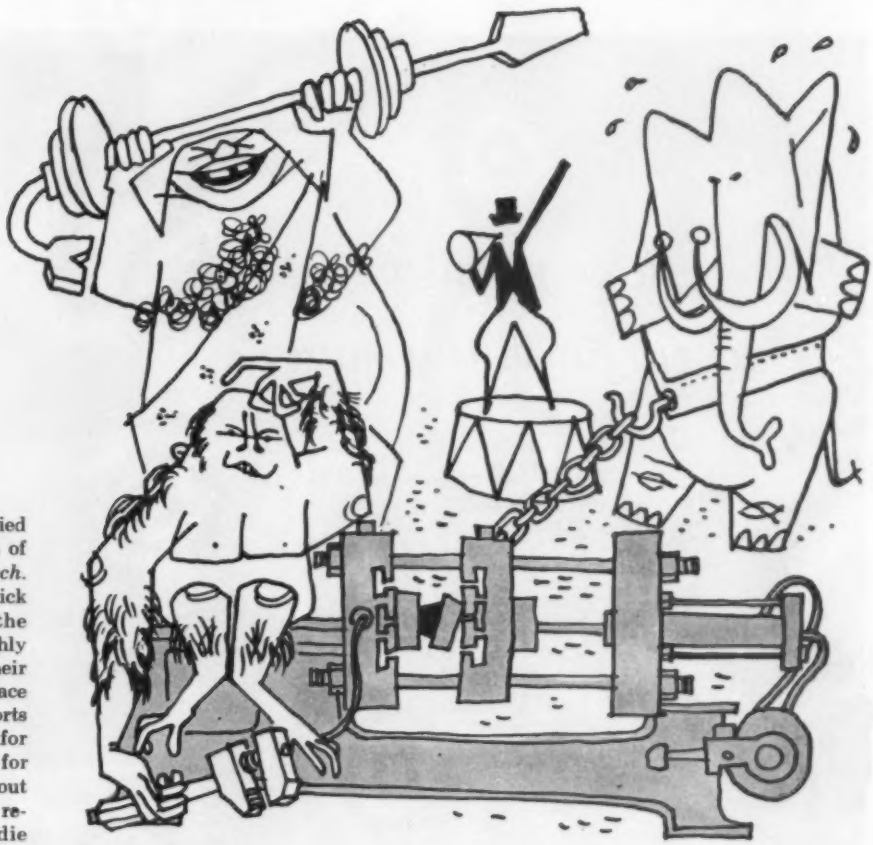
If this magazine may be sent to the writer at no charge, I would be extremely happy to receive it. All interested personnel in the Purchasing Department will have a chance to look it over each month. A.P.A., Jr., asst. supervisor, purchasing engineering (aircraft company).

Our company is engaged in the design, development, and manufacturing of airborne systems, which are designed to perform precise measurements, automatic computation of flight parameters and control of high performance aircraft and guided missiles. Our system applications include: engine control, flight control, navigation, bombing, fire control, aircraft defense, visual indication and telemetering.

Would it be possible for our company to be placed on your controlled circulation list? V.M.

PRECISION METAL MOLDING and a majority of today's trade publications are distributed by means of "Controlled Circulation" which means that we send it to people in industry who have a connection or a specific interest in the editorial field we cover.

Qualified persons can receive the magazine by filling in, completely, the card requesting that the magazine be sent them that is bound into each issue. Our auditors require that we have the individual's name, his title, the company name and the major product manufactured by the company. Ed.



from the melting pot

Research is a word that gets bandied about, perhaps because so much of it is *re* and so little of it is *search*. When we develop a new Die Slick compound all the search in the world can't prove it as thoroughly as die casters can themselves in their own shops. And that's why we place a lot of stock in users' field reports on how a new compound works for them. Our new 33X Die Slick, for aluminum, which we talked about earlier, is getting enthusiastic reports from most aluminum die casters. Have you tried it yet?

Die Slick 33X for aluminum is a combination of insulating and lubricating materials compounded with exclusive Die Slick hi-temperature lubricity oils. One feature behind the favorable field reports is that 33X has thixotropic properties. This $64,000 word means that the insulating and lubricating materials stay in good suspension even after substantial dilution with thinners. As far as 33X Die Slick is concerned, "settling" is a problem that has gone the way of the celluloid collar.

Of those who have tried 33X, most say it does the job better than anything else. A tiny minority say it's no better, but we haven't had any hostile comments yet! Will you accept our invitation to join our research team? Simply order your trial gallon of 33X. Try it. Give us your comments.

Cordially,

V. W. Smith

Don't have a circus... use Die Slick!

Removing stuck castings is a job that disrupts any die caster's routine, and it doesn't have to happen. Die Slick compounds are the worry-free method of preventing sticking, scoring and soldering, no matter what metal or alloy you cast . . . no matter how large or complicated your die.

And there's no trade secret about which Die Slick compound will work for you. If you'll ask us, we'll be glad to recommend a compound for your jobs . . . and you can try it at no risk. Order a trial gallon today, telling us the metal you use. If you don't like it, we'll pay the bill.

Die Slick is a registered trade mark of G. W. Smith & Sons, Inc.

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC., 5403 KEMP ROAD, DAYTON 3, OHIO

For more information circle No. 81 on the Reader Service Card

three products

where finish is a must...

so CLINTON *chose* KUX

DIE CASTING MACHINES

to get hardware finish quality castings

Every sales manager has told his production department at one time or another, "The product's fine, but you've got to dress it up."

At which time the production man starts talking about increased costs.

But many manufacturers have found they can "dress up" their products, and at the same time, *lower* manufacturing costs.

The Clinton Machine Company, Clinton, Michigan, did just that. "We use Kux Die Casting Machines in the manufacture of approximately 60% of the component parts of our Clinton engines, chain-saws and outboards.

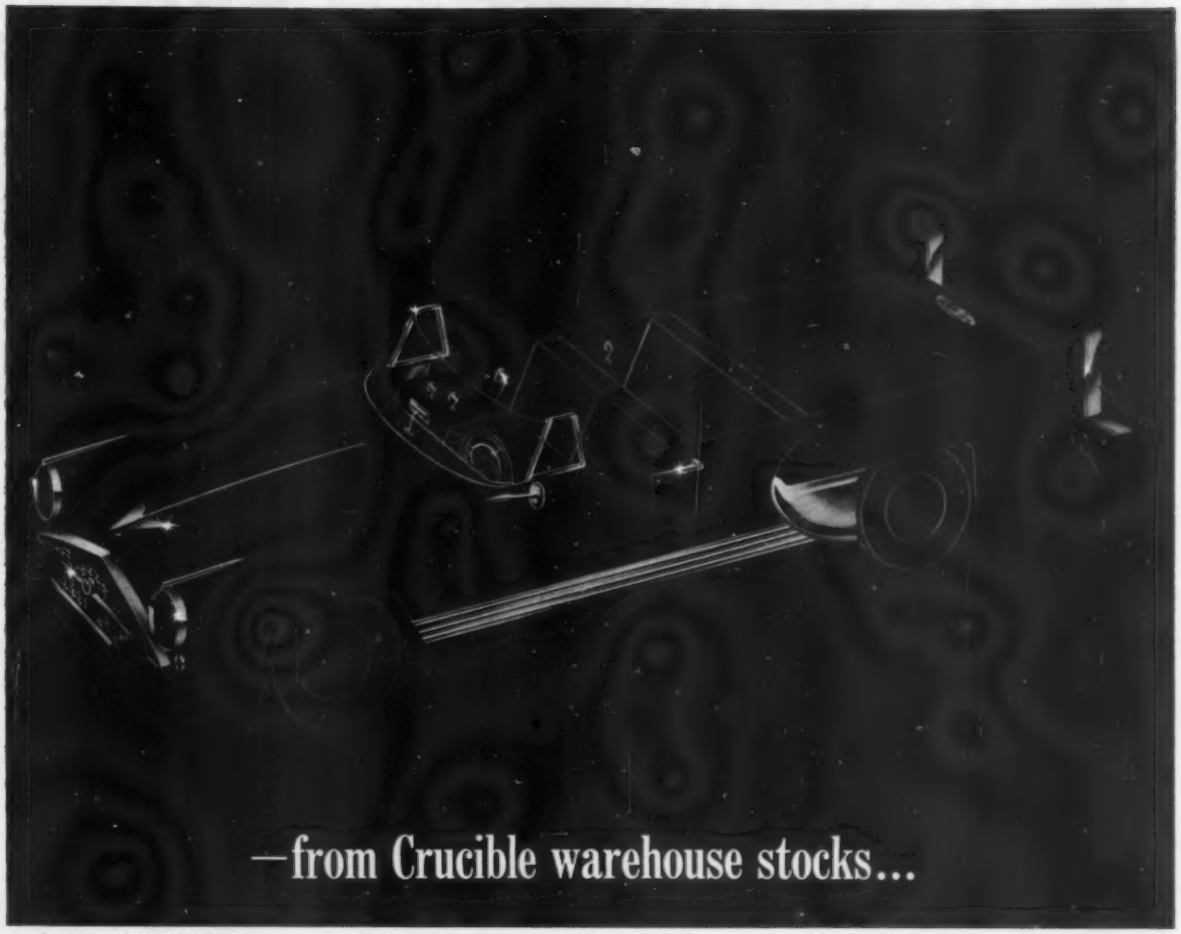
"We chose Kux because our standards require machines that give us a dense, hardware quality finish with castings to close tolerances. The efficiency and low maintenance costs of Kux Machines have cut our production costs sharply, too," says R. E. Porter of Clinton Machine.

KUX produces a full range of modern die casting machines that require only the touch of an electric button to put them automatically through a complete casting cycle at high production speeds. Kux engineers will be glad to show you how die casting machines can serve you, or write for an illustrated catalog.

MODEL HP 37 ILLUSTRATED
Hydraulically operated die casting machine for production of aluminum casting weighing up to 10 pounds.

KUX MACHINE CO. 6725 NORTH RIDGE AVENUE • CHICAGO 26, ILLINOIS

For more information circle No. 53 on the Reader Service Card



ultrasonically inspected CSM 2 DIE CASTING DIE STEEL

for auto trim

Like so many other automotive trim and hardware dies, Crucible CSM 2 was selected from warehouse stock for this long-run grill die. Built from a prehardened 25" x 15" bar, it produced 341,598 parts during the model year, and is now used for replacement parts.

Die by Valor Tool and Machine Co., Dearborn, Mich.

Like all Crucible die steels, it was ultrasonically inspected. This assures you of sound die steel quality – every time. It's a big reason why CSM 2 . . . and its partner for aluminum die casting, NU DIE V . . . are so popular that they're stocked in more than 430 sizes in Crucible warehouses from coast to coast. These sizes range from 1" to 40" wide . . . ¾" to 15" thick – and can be cut to your specifications at the warehouse.

For your die steel requirements – for holder blocks, solid dies, inserts or sleeves – you'll get *fast* delivery, sound quality from your local Crucible warehouse. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor – Railway & Power Engineering Corp., Ltd.

For more information circle No. 31 on the Reader Service Card

REED VACUCAST gives Cleveland Hardware DENSER

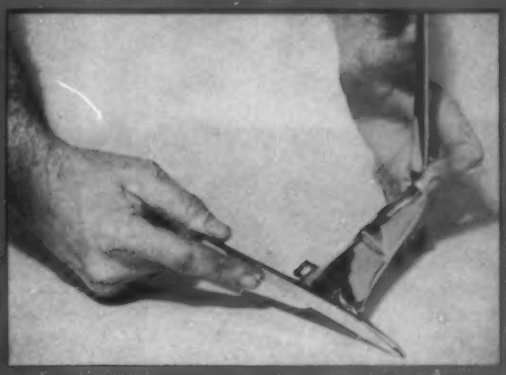
Cleveland Hardware Attributes Order For Portable TV Set Masks Directly To REED Vacucast System

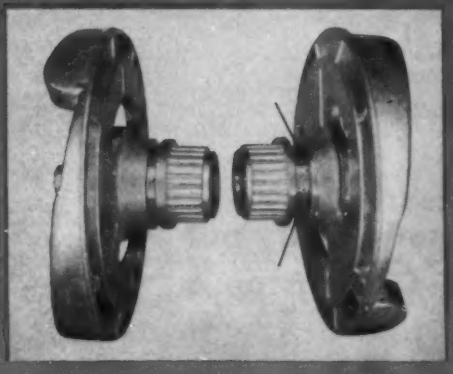
"As a result of being able to reduce wall thickness to .050 of an inch in the zinc casting for a portable TV set mask, we have received a large order," says H. E. White, President of Cleveland Hardware & Forging Company. "This mask could not have been done on a conventional die caster, but with our REED Vacucast machine, we can cast this thin-walled part despite its large area." Cleveland Hardware has also found faster cycles and a vast improvement in the quality of all castings produced on their REED Vacucast.

The REED Vacucast, a vacuum die casting system offered exclusively by Reed-Prentice as original equipment on standard machines, has proven itself in a number of standard production shops. Cleveland Hardware & Forging Company is the latest to find these many advantages in the REED Vacucast:

- Cycling time is 25% faster on some jobs.
- Reject rates have been cut by more than 50%—in some instances 90%.

CASTINGS, IMPROVED FINISH





The photos above show the strength which the REED Vacucast gives to even the thinnest wall castings—flexible enough to bend, yet strong enough to withstand breaking.

◀ Porosity was a problem (right) for Cleveland Hardware in die casting this zinc cam. Now, their REED Vacucast gives them dense castings, cuts reject rates (left).

- Surface finish has been improved, greatly reducing polishing and buffing.
- Less pressure is needed. Many find that a 400-ton machine can replace a conventional 600-ton machine.
- Permissible reduction in wall thickness has meant great savings in metal. Now competes favorably with metal stamping.
- Porosity has been virtually eliminated.
- Improved casting skin and higher density permits higher temperatures for better paint-to-part bond.
- As much as .02″ greater skin thickness in thin castings is common.

These are just a few of the many advantages found in the REED Vacucast. To find out how a REED Vacucast can help solve many of the problems you now have in die casting with conventional equipment, mail the coupon here today to Reed-Prentice Corporation, 677 Cambridge Street, Worcester 4, Mass., or contact our nearest sales office.

REED-PRENTICE

Affiliate of PACKAGE MACHINERY COMPANY

677 CAMBRIDGE STREET, WORCESTER 4, MASS.

BRANCH OFFICES: NEW YORK • CLEVELAND • CHICAGO • BUFFALO • DAYTON • DEARBORN • KANSAS CITY • LOS ANGELES

REED-PRENTICE CORP.
677 Cambridge Street
Worcester 4, Mass.

Please send me more information on REED Vacucast System as ☐ original equipment ☐ conversion units.

Name_____
Title_____
Company_____
Street_____
City_____ State_____

For more information circle No. 77 on the Reader Service Card

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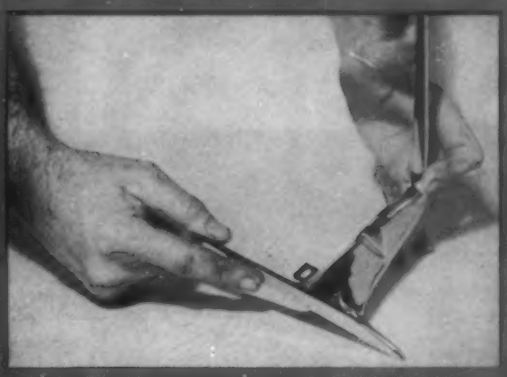

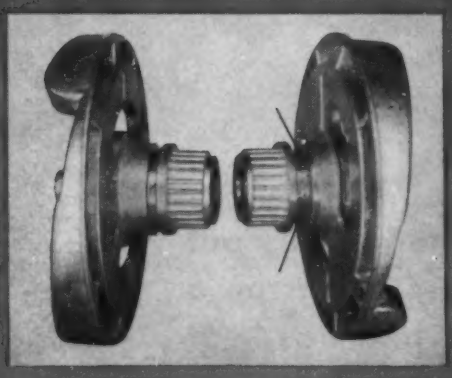

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REED-PRENTICE CORP.
677 Cambridge Street
Worcester 4, Mass.

Please send me more information on REED Vacucast System as ☐ original equipment ☐ conversion units.

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BUNKER HILL

The Zinc that originally put Zinc-Base Die-Castings on a High Level . . . and has kept them high!

BUNKER HILL ZINC, when its 99.99+ quality came into the market back in 1928, quickly proved to be a boon to the die-casting industry. It enabled die-casters to take full advantage of the inherent merits of zinc-base castings. Bunker Hill pioneered this basic change in the development of the industry. It is still a leader in the production of quality zinc for die-castings.

Today, the die-caster who wants the best is able to get the purest zinc available—Bunker Hill. If you would be interested in *trying out* Bunker Hill, let us know your requirements. We'll put you in touch with a small tonnage supplier.

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BUNKER HILL 99.99+% ZINC

Sales Office for Pacific Coast
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Both Eye and Hand Appeal Vital to Sales

with MADISON-KIPP zinc and aluminum die castings

The potential customer is quick to spot the earmarks of quality while shopping. This attraction leads to action—handling—and buying, if the "feel" of the product is convincing.

Both eye and hand appeal can be provided with Zinc and Aluminum die castings at no cost penalty and usually at a big saving.

The telling factor, however, is full process utilization. It is available at Madison-Kipp where the rare mechanical skills required are predominant and seasoned.

Please clip this ad as a reminder to contact us when you have die casting requirements.

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MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WIS., U.S.A.

Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

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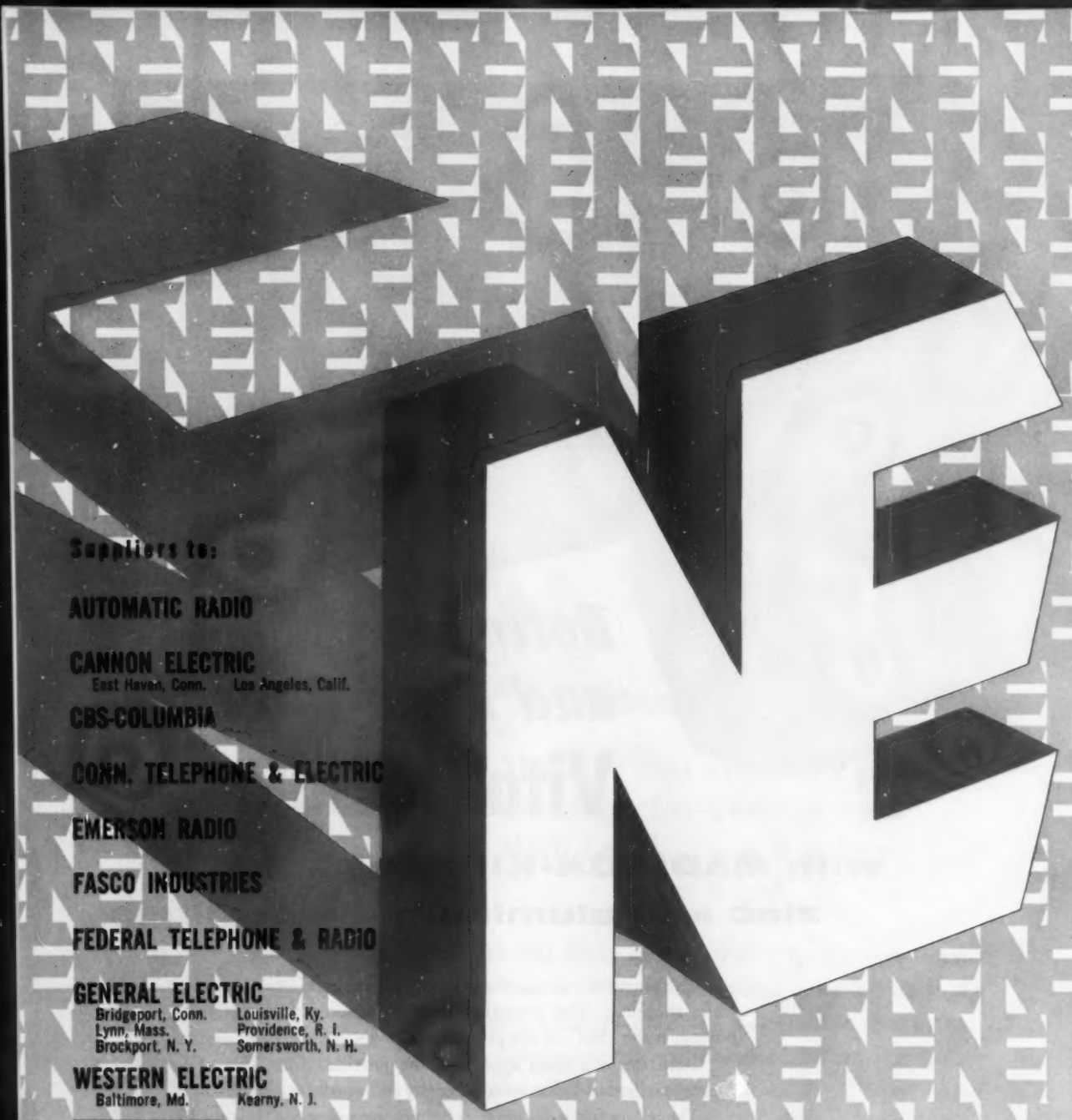

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and others . . .

Such patronage must be deserved

For more information circle No. 62 on the Reader Service Card

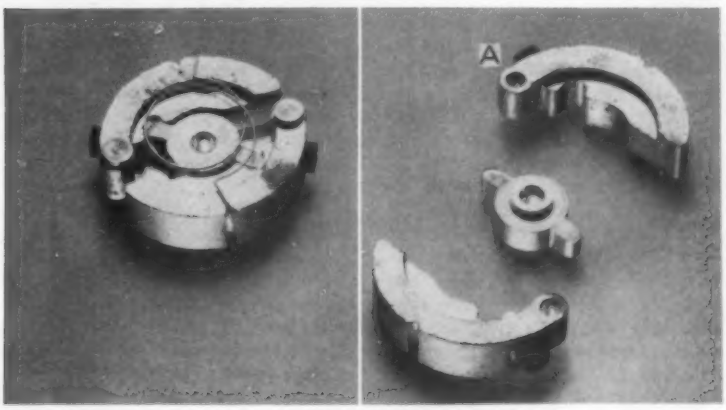
THE NEW ENGLAND DIE CASTING CO.

445 Front Ave. West Haven, Conn. • P. O. Box 1281 New Haven, Conn.

These Dial Parts Must Turn At Exactly 9.8 Impulses Per Second

DIAL GOVERNOR assembly of three powdered metal parts seen above (arrow) attached to the under-side of the telephone dial's mechanism.

Brass Powder Governor Gives Accurate Balance To These . . .



PRECISE WEIGHT control of the brass sinterings is required for smooth uniform operation.

ACCURACY of dialing on all phones is assured by these three brass sinterings.

Precision Dialing Mechanisms For Telephones

MANY of the world's dial telephones give their users smooth, precision dialing because of three, small, seemingly insignificant parts which are carefully made of powdered metal.

The Kellogg Switchboard and Supply Co. of Chicago, Illinois, a division of International Telephone and Telegraph Corp., makers of telephones, intercommunication equipment, and electronic mechanisms, give most of the credit for the speed control of their dial telephones to the precision-made parts of sintered metal which make up the governor assembly.

Every modern dial telephone coming from their plant, has them.

The parts can be seen in the photograph of the opened instrument (upper right). They are two identical balance-carriers, of sintered metal. Pressed in a semi-circular shape, they are held in place by a third powdered metal piece, a governor bar.

The two semi-circular parts are identical and act as clutching brake-shoes. They are designed to maintain the speed of the dial.

The speed is carefully regulated, being normally limited to 9.8 impulses per second. Tolerances imposed on the speed of the dial

USING POWDERED METAL PARTS GIVES GOVERNOR-WEIGHTS DESIRED BALANCE

are low, plus-or-minus two-tenths of an impulse. Tension is varied by use of the spring seen atop the governor assembly.

A hard rubber bushing is pressed into a hole which is drilled, by Kellog, into each of the two semi-circular parts. After the rods are pressed into the holes, a circle-radius is ground on the rubber rods and the two parts are attached with a nickel-silver bar. At this point a third powdered metal part joins the two semi-circles.

This third piece is a knurled shaft, and is connected to a clutching gear. Tolerances must be close and are strictly held.

They are plus-or-minus .001" on all powdered metal parts and on the final, entire assembly itself. This tolerance is based on the radius of the complete assembly measured from the center of the circle made by the assembled governor. After the sintered parts have been assembled, all three become one single, compact unit before the grinding of the rubber rods.

After grinding, the assembled pieces which together make up the governor of the dial phone, are not interchangeable. A directional mark is stamped on the center-bar showing the direction-in-assembly of the two semi-circular parts. If the sintered parts become dis-assembled, they must be put back together again according to this directional mark. And, they may be re-assembled only with each other.

The dimensions of the entire assembly are difficult to control because of the necessary machining of the hard rubber rods.

Because sintered pieces are used to make up the working parts of the governor-assembly, absolute balance can be maintained. Needless to say, this characteristic is a prerequisite of any governor-mechanism.

Only Method

According to Kellogg engineers, there is no other way such near-perfect balance of mass, weight, and density can be obtained economically except by taking advantage of the powdered metal process

The close adherence to the three-fold tolerances of weight, balance, and dimension, are the result of first pressing the powdered copper-base alloy, then sintering it, last of all coining it.

The two semi-circular pieces must weigh seven grams. They have a tolerance variation of one-tenth of a gram.

Even before the holes are drilled in order that the hard rubber rods may be inserted, the two semi-circular parts are checked by Kellogg. The drilling is done at their plant.

Before drilling, the two identical parts must each weigh 4.1 grams. The only variation permitted is limited to within a tolerance of plus-or-minus eight-tenths of a gram each.

The whole must be absolutely friction-free after assembly.

Apparently there has been little or no success, with the use of other than sintered metal parts as the essential basis of a governor assembly, to keep and maintain the smooth moving action of the dial telephone. At one time steel may have been used, but according to Kellogg's engineers, powdered metal has been the specified material within the scope of their memories.

At first, Kellogg men admit, there were several problems connected with the use of the powdered parts.

The biggest problem was connected with drilling the holes in the weights. These holes are necessary in order to assemble the parts and studs. But the density was low, and it was difficult to keep it uniform. Consequently the sintered pieces were unable to submit satisfactorily to the machining operation.

After many rejects, Kellogg men recall, the density of the parts was developed so that it improved. This together with the added ductility, made them easier to machine and the number of rejects fell off to a sufficiently low point so that practical production became possible.

WHY ONLY POWDERED METAL GOVERNOR PARTS WILL DO:

W. R. Whittle, asst. purchasing agent for Kellogg at their Chicago plant, pointed out the following reasons why only sintered metal parts are practical:

First, because of the type of the assembly, little machining of the parts is necessary.

Second, the parts must be in balance. It would be almost impossible to do this with any other but powdered metal parts.

Close Tolerance

Third, the parts have close tolerances which must be maintained. No other production method could economically hold such close tolerances.

Fourth, the metal used is a copper-base alloy. It would be difficult to use this metal if the parts were machined.

And the fifth, and most important reason as far as Mr. Whittle is concerned, is the fact that a great deal of cost of the parts is saved by using those of sintered alloy. This amounts to an impressive saving of fifty-percent.

Economy and Corrosion Resistance In A Lure Retriever

CORROSION RESISTANCE, adequate weight and economy in production are the factors of prime importance in this lure retriever. Zinc die castings are the best answer to all of the requirements.

ONE of the latest "lures" to attract the fisherman's equipment dollar—a bait retriever to prevent loss of snagged bait and hooks—has certain construction requirements which are best met by zinc die casting.

The device is essentially two hollow cylinders, one fitting inside the other, which is placed on the snagged fish line through aligned ⅛-inch slots running the length of both pieces.

When the inner cylinder is rotated, the slot opening closes, and the retriever slides down the line to free the bait.

A primary requirement is smooth surfaces on all parts of the device, as any rough, jagged edges or sharp corners would fray or break the line.

Constant contact with water demands reliable corroion resistance throughout.

And the retriever must be mass produced at a relatively low cost.

The outer casting is about 2½ inches long with an outside diameter of 1⅝ inches. The inside diameter is 1⅜ inches at the bottom and 15/16 inches at the top. The thicker top section, 7/16 inches deep, provides a shoulder which helps hold the inner cylinder in place.

A one by one-quarter inch horizontal opening, countersunk at one end, is cast into the outer part. A stationary threaded screw mounted on the inner casting slides back and forth in the slot to rotate the inner cylinder.

The device is locked in the closed position with a serrated nut which fits into the countersink accurately.

Four pieces of aluminum chain, each about six inches long, hang from the bottom of the retriever to prevent further snagging of the bait as it is pulled to the surface of the water.

The accompanying chart shows the relative number of steps in producing the retriever from sand casting, wrought stock, or die casting components.

Other cost saving advantages of die casting include: no scrap loss, no machining, no extensive need for skilled labor, no heavy investment in machine tools, no need for stocking semi-finished parts in various stages of production, and no plural inspection.

After casting, the cylinders are degreased, cleaned, and barrel finished to give a surface ready for the final coating.

Castings are mounted on racks and dip-coated in a metallic brown enamel, which is then baked to give a hard, smooth, and attractive finish. The final enameled zinc finish provides protection against corrosion as well as a saleable appearance.

Final production steps are mounting the locking screw and nut and attaching the chains.

The finished product weighs 10 ounces, which is sufficient weight to do an effective job of unsnagging bait and hooks without being to cumbersome for a fisherman to handle with one hand.

The retriever is made by the Westbrook Mfg. Co., an affiliate of Paramount Die Casting Co.

OPERATIONS	SAND CASTING	WROUGHT STOCK	DIE CASTING
OUTER CYLINDER			
Cut off		X	
Face	X	X	
Cut ⅛-inch slot length of piece	X	X	
Mill radii of 4 slot corners	X	X	
Drill 5 holes	X	X	X
Mill locking screw slot	X	X	
Counterbore	X	X	
Bore inside circumference for shoulder	X	X	
Chamfer top and bottom of inside circumference	X	X	
Stamp patent numbers on end	X	X	
Surface finish	X	X	X
INNER CYLINDER			
Cut off		X	
Face	X	X	
Cut ⅛-inch slot length of piece	X	X	
Mill radii of 4 slot corners	X	X	
Drill one hole	X	X	X
Chamfer bottom of inside circumference	X	X	
Surface Finish	X	X	X

COVER STORY

DIE MAKING is only one of the fields where the Trigulator finds extensive application.

Instrument Maker Solves

By L. H. FITCH
Fitch Instruments Inc.
Pottstown, Pennsylvania

INVESTMENT castings have been used successfully in the manufacture of an instrument which is used to design dies more accurately. The dies made with the help of this instrument, which is known as the "Trigulator", are of various types including those used to make die castings and investment castings. According to the facts of its origination, the instrument was conceived by a die maker.

The instrument is made up of several brass castings produced by the investment process which were specified for a number of important reasons.

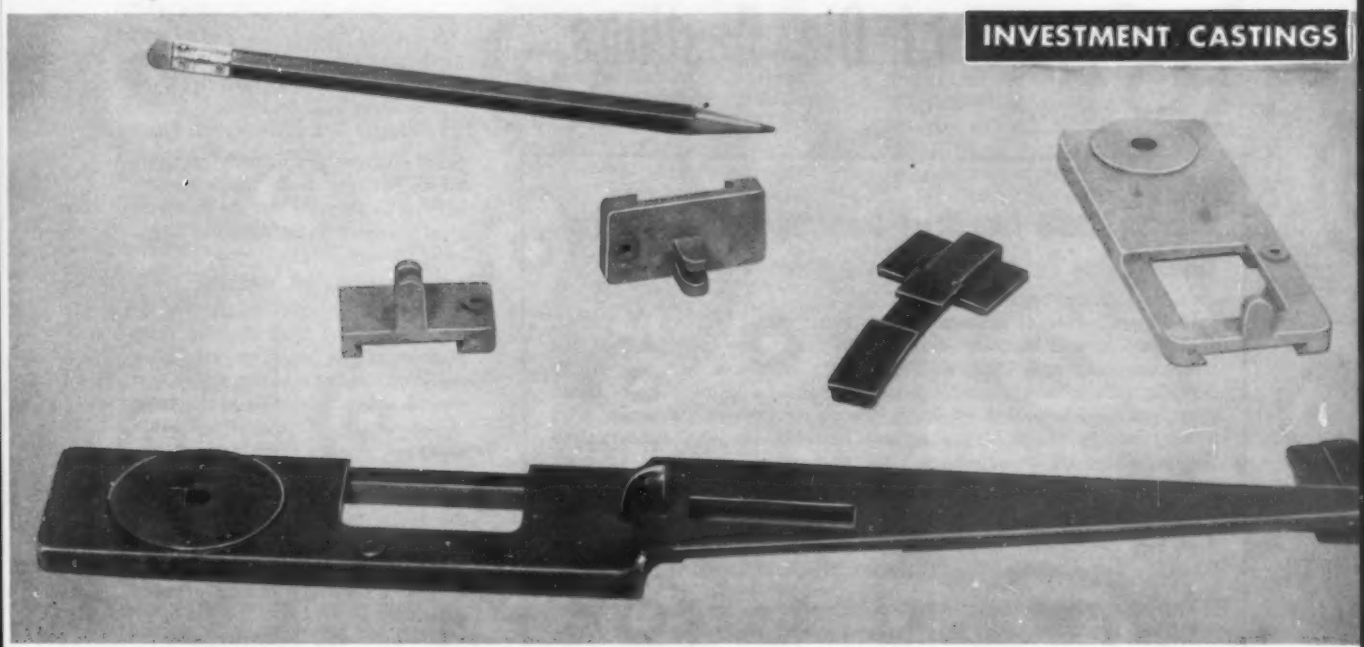
Among these reasons is the fact that investment castings are the answer to many parts problems, especially those of the small manufacturer who has an inventory problem. Most small manufacturers' low production rates do not lend themselves to economical mass purchases or processing of raw materials. Use of investment castings overcomes this problem. For example, approximately $7.00 apiece was paid for the long castings (seen above) in small quantities of 100 or less.

The minute detail necessary in design of the instrument can only be had economically by casting the part, preferably in a steel mold. The problems of expensive steel, labor, and construction costs can be avoided, and the troublesome questions of die-life and die-design sidestepped by using the investment process.

Only a plastic master or pattern is shaped by the required die. This die can be made of inexpensive steel at great savings in labor

PROBLEM To make a precise, complex instrument economically

SOLUTION Investment castings to cut inventory and machining



MINIMUM MACHINING plus accuracy of minute detail are just a few of the advantages that result from using investment castings in brass and bronze for many of the important elements in this mechanical problem solver. Reduced inventories and simplified purchasing are some of the other advantages secured.

Production Problems

costs, thus solving the mold or die problem.

Uses Five Castings

The "Trigulator" uses five bronze castings and three zinc castings which are purchased in small quantities. Investment castings in bronze are much more economical than bronze die castings or sand castings. Since investment castings of any required material can be produced to almost any desired tolerance, the parts are cast to within .010" to .015" over the finish size. Thus only a small amount of machining is needed.

One casting (seen above) needs light, skin cuts in a few areas such as the 30° dove-tailed slide, the fulcrum bushing areas, and the spots for the vernier plates. Total machine-time is less than 30 minutes when parts are made in lots of five and ten pieces. This gives a total cost to sales of less than $10.00 each for the parts.

Variety of Materials

An added advantage of using investment castings in the production of a product is the important factor of the variety of materials which may be used. It is possible to cast almost any type of metal, with any type of metal-structure from the plastic master produced in the original mold. If the manufacturer wants to switch from bronze to another kind of metal, the dies used at the present time might be utilized with little or no troublesome alteration.

This quality of the investment casting is of great help in the type of work being done in a plant where a large amount of experimentation is sometimes needed before a product is ready for marketing and distribution.

Die-Building Aid

As an aid in the art of engineering or die-building, the precision instrument described here will calculate the unknown co-ordinates of any triangle. It can calculate problems in trigonometry and eliminate the need for trigonometric functions, equations, and mathematics, and gives a direct, visual reading of the problem's unknown co-ordinates.

DIE CASTINGS

Practical Guide For Buyers of Die Castings

What You Should Know About Commercial Practices And Trade Customs When Purchasing Die Castings.

In the purchase of castings from a commercial jobbing die caster, there are certain commercial practices and trade customs that are both assumed and implied. Purchasers who are accustomed to dealing with jobbing foundries have acquired a knowledge of these practices over a period of years. Those companies, however, who have recently started to purchase castings or who contemplate the purchase of die castings may find some confusion existing between the thinking of the purchaser and the vendor.

To clarify such confusion and to assure uniform practice so that bids can be more readily compared; the American Die Casting Institute has published the "C Series Product Standards."

The material covered in these standards are the generally accepted trade customs that have evolved from the past half-century of industry-wide production experience. They have been widely accepted as good business practice. They are the commercial arrangements normally found in the proposal and acknowledgement forms used by the die casting industry.

The entire series of standards on commercial practices and trade customs will be printed in this and subsequent issues of PRECISION METAL MOLDING. Those readers who may want copies of the standards, punched for a three ring binder, can secure them from the American Die Casting Institute, Inc., 366 Madison Ave., New York 17, N.Y.

The new C Series Product Standards include: 1. Commercial Terms — 2. Shipping and Delivery Practices — 3. Dies and Tooling — 4. Escalation of Prices — 5. Metal Market — 6. Labor Cost — Handling Inserts in Die Casting Orders — 7. Warranty Covering Die Casting, Extent, Limitations — 8. Limitations on Inspection Procedures.

Commercial Terms of Die Casting Orders

TERMS: Each die caster sells his products on his own individual terms and conditions. Normally, these provide for advance, or progress, payments for die casting dies and special production tooling and for standard credit for die castings. Shipments are, generally, FOB the city in which the die casting plant is located.

TAXES: Sales or use taxes, excise taxes, taxes on transportation, and other direct taxes are the responsibility of the purchaser whether taxes are federal, state or local.

CREDIT: The die caster, generally, reserves the right to change his terms of payment if the customer's financial condition requires it. Such changes are usually requested in writing and, when necessary, may require the die caster to stop production or suspend shipment pending agreement.

ACCEPTANCE OF ORDERS: Proposals or bids covering the building of dies and tools and the production of die castings are prepared on the basis of the prints and specifications available at the time of estimating. Frequently discussions of design and application result in changes that may affect costs. Die casting proposals are therefore for immediate acceptance on the basis specified. The die caster reserves the right to review all orders before accepting them.

The proposal, the order, and its acceptance signed by an authorized representative of the die caster, constitute the entire contract except that when any provisions of the order conflict with the proposal, the proposal and acceptance always prevail. Modifications, changes, additions, cancellations or suspensions of an order are not binding upon the die caster unless accepted in writing by an authorized representative of the die caster and upon terms that will indemnify him against all loss.

RE-ORDERS: Re-orders for die castings are covered by the same conditions as was the original order provided no revised proposal and acceptance has intervened. Re-orders are subject to the escalating provisions of Product Standard ADCI-CA.

ERRORS: Clerical errors are, of course, subject to correction regardless of whether they favor the buyer or the seller.

Shipping and Delivery Practices

SHIPPING TOLERANCES: Since the die caster cannot determine in

advance the number of die castings rejected by his inspectors, it is generally recognized that he may manufacture and ship 10% over or 10% under the number of die castings involved in a single production run.

DELIVERIES: Deliveries of die castings, unless otherwise specified, generally begin as soon as the die caster's schedules permit after approval of samples, and are made in accordance with the estimated production requirements and capacity of tools until orders are completed. Postponement of deliveries beyond a reasonable number of days usually requires approval of the die caster.

Deliveries are contingent upon strikes, labor troubles, manpower shortage, fires, delays of carriers, accidents to machinery, priorities, state, federal and local government authority, acts of God or public enemies, and other causes beyond control. Cancellations for the convenience of the Government are handled as required by the law.

PACKING: If, because of the nature of the die castings, it becomes necessary to provide a special carton or method of packing, or if the customer requests such special carton or method of packing, he will be charged this additional cost if it is not already included in the price quoted.

Die Casting Dies and Production Tooling

Any die casting can be produced in a number of different ways and every die casting plant possesses different equipment and utilizes varying production techniques in making dies.

Optimum economy and maximum efficiency for the production of any die casting, therefore, must be considered in the light of the particular equipment with which it will be produced. Thus, the experience of the die caster and his skill and ingenuity are all involved in selecting the method of production on which he bases his particular proposal.

Engineering and design assistance are supplied, without charge, by the die caster so that the die casting dies, and the special tooling for trimming and machining, represent final integrated agreement on the die casting to be supplied and its relationship to the customer's product and production procedure. The die caster plans for high efficiency over the life of the job in order that both the price he quotes and the product he delivers will protect his reputation and competitive ability.

In addition, the die caster maintains and repairs the die casting dies and production tooling without additional charge to the customer and, when volume justifies, also undertakes to replace the dies without charge or upon a mutually agreed upon basis.

Since die casters are *not* commercial die and tool shops, and since dies and special tooling are considered adjuncts to each die caster's production of die castings, the charges made for such tooling are figured on a service basis.

For these reasons, it is customary practice to provide that the die caster shall retain possession and control of die casting dies and special tooling.

It is also customary to provide that dies and tools which have not been used for three consecutive years for production of die castings may be scrapped, without notice, by the die caster.

Escalation of Prices For Die Castings

Because of the job-shop nature of production and the variation in product design and specifications, the prices for die castings are determined by the use of price estimating formulas. Each die caster employs an individual pricing formula constructed in accordance with his individual methods and costs. Yet all price estimating formulas contain a number of factors which require automatic adjustment, upward or downward, because of conditions beyond the estimator's control.

Metal Market

Prices for die castings are estimated at the quoted price for the alloy specified, as shown in American Metal Market or Engineering and Mining Journal, on the day the estimate is prepared.

Discussion of design and production detail, as well as purchasing department procedures, often delay the placing of an order. The manufacture of dies and tools, the submission and approval of samples, and the establishing of workable inspection procedures must also intervene before production of the die castings involved can be started. These delays often involve several months from the day on which the price was estimated. During this period the metal markets may move upward or downward. Such fluctuation is beyond the control of either the purchaser or the die caster and the actual price charged for the die casting will reflect the changes required to adjust for all metal market variations.

Similar adjustments are made on each release and/or reorder.

Labor Cost

Many die casting dies continue active over extended periods, often over many years. Labor costs, if changed after the date of the original price estimate, may necessitate price changes for any future deliveries.

Customer requirements schedules often are expanded and sometimes require production beyond the normal schedules of the die caster. Since all die casting prices are estimated on the basis of production at straight-time rates, an adjustment is required if premium labor rates are necessary to meet the customer's expanded needs.

Die casting price estimates and quotations reflect labor cost based on continuous operation for the quantity specified for any delivery release. Reductions in scheduled deliveries, or production interruptions by the customer may affect labor and other costs per piece. In such cases a price adjustment may be necessary.

Handling of Inserts In Die Casting Orders

The flexibility of die casting and die casting design is reflected in the growing use of inserts placed in the die and cast in place in the die casting. Many materials are used for inserts and care is required by both the die caster and purchaser in specifying the areas of responsibility involved.

Inserts are supplied by the purchaser of the die casting and the cost of the inserts is *not* included in the prices quoted by the die caster. The labor cost for placing the insert in the die and the resulting production rate *are* cal-

Continued on next page

culated in the price estimating procedure.

The design of the insert is subject to approval by the die caster.

To cover in-process spoilage and rejects, the purchaser is obligated to supply uniform, usable inserts to the accuracy agreed upon, in quantities greater than the number of die castings that were ordered.

The die caster does *not* include in his price any provision for inspecting or counting inserts and, consequently, assumes no liability for the damage that may be caused to dies, tools or fixtures by defective inserts.

For the same reasons, the die castings containing inserts are *not* subject to rejection if the insert is defective or causes excessive fins, flash, or other imperfections.

A shortage of inserts can result in interference with, or stoppage of, production. Losses or increases in labor cost that result are chargeable to the customer.

Inserts will be stored and handled by the die caster as a service to the customer but at the customer's risk.

Gauges

The purchaser is expected to furnish gauges which are required in inspection of die castings. This is important where mating parts have a requirement as to fit, as well as for die castings that are to be assembled with other parts not manufactured by the die caster. Such gauging labor, *if specified* is covered in the price quoted for the die casting.

Warranty Covering Die Casting

1. GENERAL COVERAGE

Die casters, just as other responsible manufacturers, stand behind their product. However, in assuming this proper responsibility, it is necessary to consider the known variables of the die casting process, the job-shop nature of the industry, the purchase order and purchasing procedure of the customer, the engineering and design discussions, changes, and agreements which may have taken place between the submitting of the original proposal, revised proposal, order, acknowledgment, and final agreement on all details of die casting production.

2. EXTENT OF GENERAL WARRANTY

In general, die casters agree, at their option, to correct, replace, or issue credit for, defective die castings subject to specific limitations and exceptions.

3. LIMITATIONS ON WARRANTY

a. Processing after delivery. No warranty attaches to a die casting which has been altered, machined, or finished, after delivery by the die caster.

b. Reasonable time. No claim for defective die castings will be recognized unless made in writing within the time after delivery specified by the die caster.

c. Returns subject to approval. Die castings claimed to be defective are not to be returned to the die caster without specific approval after inspection by the die caster. Returned goods accepted by the Receiving Department of the die caster are not excepted from the right of the die caster to inspect the die castings or to determine the extent, if any, of his liability.

d. General limitations. Losses, damages, or expenses arising from the use of a die casting, or labor costs, or other charges incurred outside of the die caster's plant, or transportation costs, as well as losses due to other causes, are not acceptable basis for claims against die casters under the warranty provisions. The warranty as stated in paragraph 2 of this Standard is limited to the repair or replacement of the defective die castings or the issuance of credit for their return as stated.

Limitations on Inspection Procedures

1. Prints and approved samples. Die castings may not be rejected because of variation from print dimensions if they are made to, and are unchanged from, approved samples with respect to dimensions, finish and analysis; or for failure with regard to function, or fitness for use, when the purchaser has specified or approved the design. If sample die castings have not been approved and conflicting models and prints have been submitted, the basis of actual acceptance shall be agreed to in writing.

2. Accuracy. Die castings may not be rejected if they vary from finished sizes or dimensions within the limits established in the applicable Product Standards for Die Castings published by the American Die Casting Institute. In the absence of such a standard, accuracy will be subject to the commercial variations generally prevailing in the industry. Where very close tolerances, or particular dimensional accuracy is specified, the permissible variations shall be agreed upon before die work is begun.

3. Inspection and Sampling Procedures. Unless the specific basis to be used is acknowledged and agreed to by the die caster, die castings may not be rejected on the basis of statistical quality control or other sampling procedures; or on the basis of profilometer readings; or on the basis of inspection by X-ray, Zyglo, or similar methods; or on the basis of pressure testing or other special testing.

Statistical quality control standards or systems which are designed to recognize the inherent variables of the die casting process in all metals, for each alloy, and for all uses, have not yet been devised. Whether adequate procedures of this type can be developed in the future is not known, but present use of such procedures requires cut-and-try methods and prior mutual agreement on all details involved.

Surface roughness designations developed for mechanically produced finishes (such as symbols under Standard NAS-30 or R.M.S. symbols under Mil Standard-10) are not applicable to natural die cast surfaces. Therefore the use of profilometer or similar roughness measuring devices may not be considered as a basis for rejection of the parts.

X-ray, Zyglo, and similar inspection methods are not acceptable or valid for all die castings. In some cases, where specific critical characteristics are involved, and where the inspection criteria can be determined as valid, these methods have been employed, but for general or indiscriminate use they have not been found suitable.

Similar experience with existing *pressure testing procedures* indicates limitations which make them of doubtful value not generally applicable. For specific die castings, specific criteria may in some cases make such procedures more or less feasible.

Inspection and sampling procedures of these general varieties

Continued on page 120

Fire-Resistant Hydraulic Fluids For The Die Casting Industry

Part 6: Safety & Use Factors

By Lawrence Jackson, Plant Superintendent
Withrow Die Casting Co., N. Hollywood, Calif.

THERE'S nothing wrong with a petroleum oil being used as a hydraulic fluid, that is, if it remains safely inside the hydraulic system. But let a line break or a hose rupture in the vicinity of high temperatures, and normally placid petroleum oil, shooting out under high pressures as an air-oil mist, will ignite instantaneously. This ignition can take place even when the source of heat is as far as forty feet away from the broken line.

With a flash point of 375 F or higher and autoignition temperature over 700 F, these oils become fire hazards if exposed to such ignition sources as molten metal, hot metal surfaces, open flames, sparks and arcing electrical equipment. The results can be serious, costly and even disastrous.

In our plant, several years ago, a line extending over a pot of molten zinc broke and about 120 gallons of the hydraulic petroleum oil pumped into the pot. There was an immediate flash fire that spread rapidly wherever the oil flowed. All the electrical panels supplying the building plus the power transformer burned out; the office and roof were ruined; water flooded the plant. Cost of the damage, including the rebuilding of the gutted die casting machine, came to $35,000.

On another occasion, a split developed in a high-pressure steel line feeding the injection cylinder of a machine die casting aluminum. Over 120 gallons of pressurized mineral oil sprayed into the air. The machine operator's first reaction, a normal reaction under the circumstances, was to get away from the area as quickly as possible. Since the cut-off switch was located on the opposite side of the machine, the operator did not stop to pull it before dashing out of the danger zone. As a result, the pump continued to operate until there was no oil left in the reservoir. The machine was out of service for over three months.

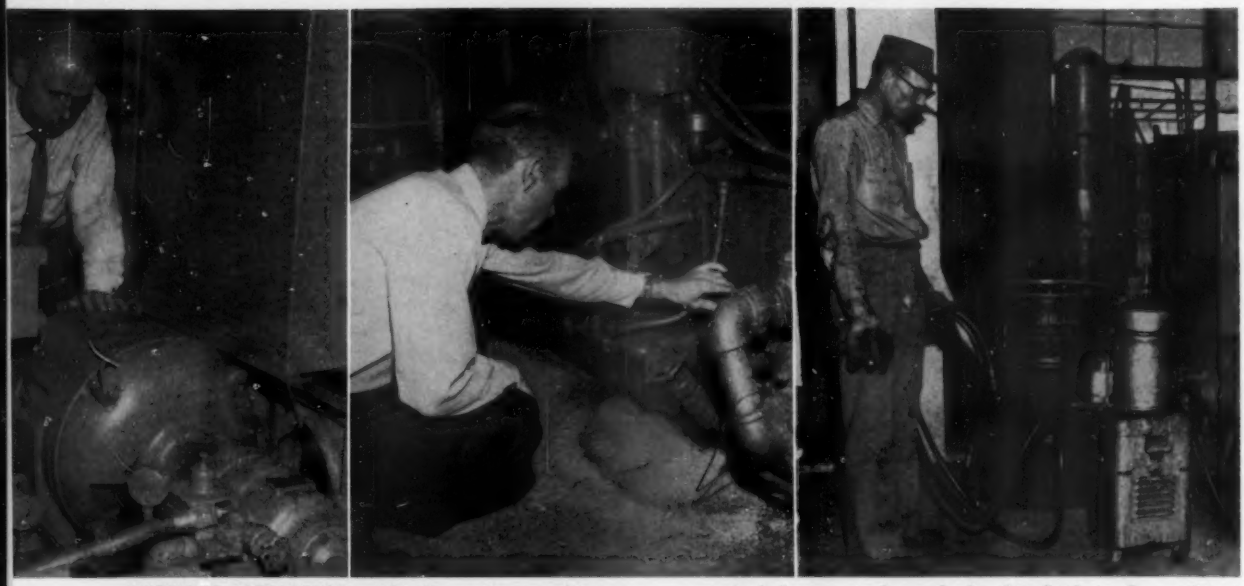
In addition to the extensive damage caused by these fires, production was disrupted, holding up deliveries of the zinc and aluminum castings we supply for building and plumbing hardware, automotive accessories, commercial gas valve bodies, model gas engines and many other industrial components.

When the management of Withrow Die Casting Company decided to switch over to a fire resistant hydraulic fluid, we were primarily concerned with the safety of the workers, plant and equipment, but economy was a factor that couldn't be overlooked. For these reasons we selected Irus Fluid 902, a water-based emulsion type hydraulic fluid manufactured by the Shell Oil Company. In addition to its excellent properties as a fire snuffing fluid, it is also economical, costing up to one-third less than other conventional fire resistant fluids.

Irus Fluid is unique in that it refutes the belief that oil and water cannot mix. A combination of petroleum hydraulic oils, water and emulsifiers, it turns instantly into steam and vapor when exposed to any source of ignition, either in its liquid form or in a high pressure spray.

All of our die casting machines have been charged with this fluid during the past two years. Breaks in hoses, pipes, and fittings have caused no fires, no worker injuries and no plant or machinery damage. Two specific instances can be cited.

One line break discharged about 40 gallons of the fluid onto a pot of molten aluminum. After the steam blew out, only a small flickering flame remained which was confined to the pot and died out quickly. On another machine, a hose connecting a hydraulic core pull severed, and the fluid sprayed out under a pressure of 1000 psi, drenching the operator and the surrounding shop area. Because there was no danger of flammability, the operator was able to shut off the power supply and stop the flow of fluid. The



WITHOUT ALTERATION, eight die casting machines were converted from petroleum hydraulic fluid to fire-resistant fluid. The high pressure pump, left, showed only normal wear. Due to the distinctive color the presence of small leaks is easily detected, center, and both filling and emptying of the machine, right, is easily done with a small pumping unit.

machine was back in operation shortly after the defective hose had been replaced.

CHANGEOVER TECHNIQUE

While switching from the conventional petroleum oil to the fire resistant fluid was not difficult, care was taken to ensure the thorough cleanliness and tightness of the hydraulic systems. Proper installation of the fluid and prevention of system contaminants has resulted in trouble-free operation. The identical changeover procedure was followed for each of our eight die casting machines: five Reed-Prentice of 275 ton capacity and three B & T of 450 ton capacity.

1. Drain out all of the mineral oil.
2. Use Irus as a flushing medium and run for 15-30 minutes.
3. Drain out and recharge with Irus. Run for one week.
4. Drain out and recharge with the fluid.

Besides being easy to install, the fire resistant fluid is also advantageous in that no new or special machine components were required such as packings, O-rings, seals, etc. In fact, we found that the machine worked better by removing certain components — screen-type filters on the suction lines were removed from the tank and the fine filters on the intake to the pump; fine oil purifiers were also taken out since effective machine operation was possible without them.

MAINTENANCE

Equipment checks are made daily but major problems are handled on the week-ends when the plant is shut down. Leaks are fixed, fittings are tightened and the hoses replaced as necessary. The distinctive yellow color of Irus Fluid has helped immeasurably in cutting down make-up losses. Leaks and seepage show up plainly and the color of the fluid remains constant in operation. Make-up runs to about 70 gallons monthly for all machines, compared with nearly double that amount for mineral oil. Temperature of the fluid is 108-110 F, much cooler than formerly.

The pumps we use are Vickers VO combination low and high pressure, double vane. Some of the machines are equipped with 15 hp (1000 psi) pumps while others have 25 hp pumps (2000 psi). Only negligible wear was encountered in the high-pressure cartridge in the pumps, the interior face of the eccentric ring becoming uneven. This cartridge lasts about six to eight months and is replaced at a cost of $20.00.

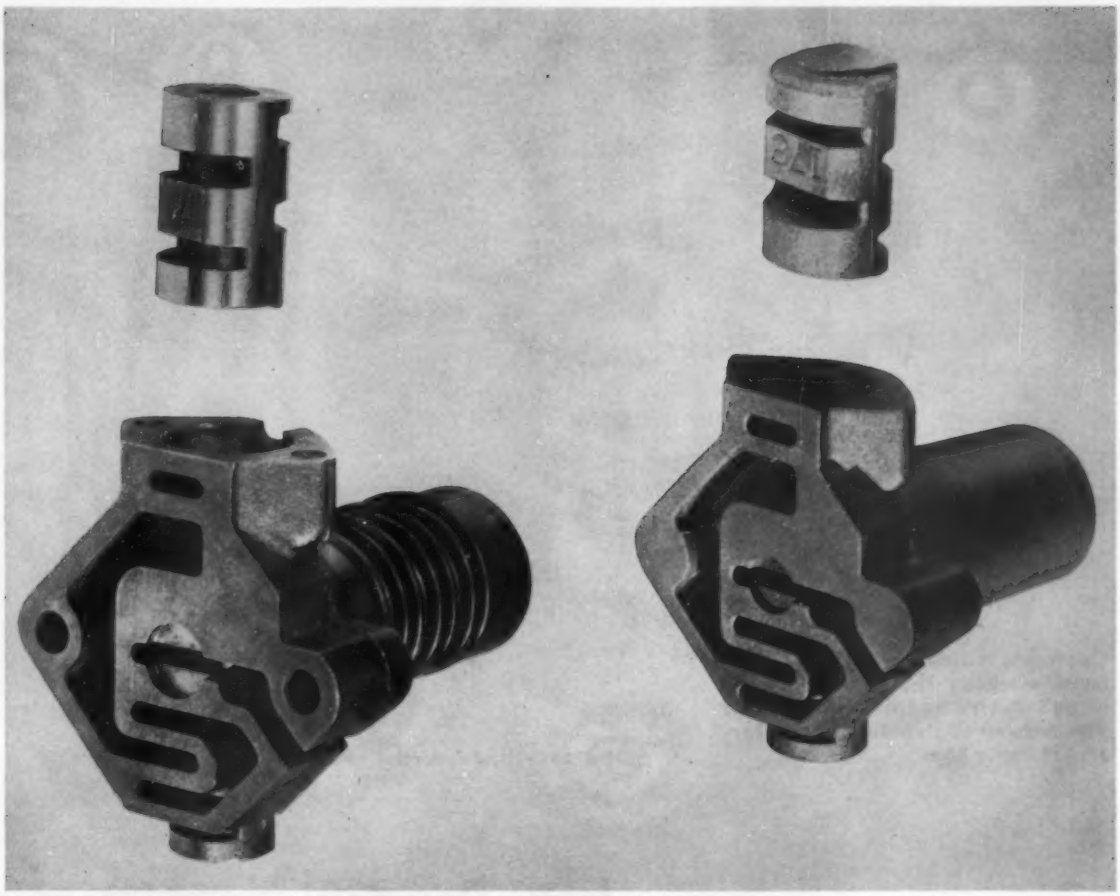
Pump part replacement costs run to about $200 yearly for all machines and this is considered negligible in light of the safety afforded by the fluid. Pump service life on some of the machines is better than others and we attribute this to better design of the hydraulic circuits.

It is interesting to note that for the past year there has been no wear whatever on the 48 gallon VC Vickers pump on a B & T machine operating at 2000 psi.

A one-third hp Mayhew, electrically-operated pump unit is used for the transfer of fluid in and out of the machines. This pump was equipped originally with a filter, but it was removed because of its high density.

Because there is always the possibility of some evaporation of water from the fluid, water content is checked monthly. A solution consisting of 50 per cent fluid taken from a machine and 50 per cent acetone is shaken in a tube and then allowed to settle out. Thus far the water content has remained stable at 35 per cent and we have yet to add water.

In summary, we regard the introduction of fire resistant hydraulic fluids as one of the finest advances made in the die casting industry. If what we have described will prevent just one fire, this article will have been more than justified.



INTRICATE CORING required in this automatic transmission governor body precluded the use of a sand casting. The rapid wear on an aluminum casting required that the part be made in grey cast iron. Only shell mold casting could provide all of the requirements.

Shell Mold Casting Solves Core Problem

THE modern automatic transmission depends, for proper functioning, on highly complex hydraulic circuits. These hydraulic circuits might be likened to the printed circuits so widely used in electronic components, with the difference that an oil path of relatively large cross-section area must be provided instead of a very small electrical conducting path.

Typical of the parts used for automatic transmissions is the governor body shown in the illustration seen above.

This governor body was originally designed as an aluminum casting. Life testing soon showed that the steel piston rings used in conjunction with the body caused excessive wear in the ring grooves, malfunctioning resulted from this wear. It became necessary, therefore, to go to cast iron and this, of course, meant either a sand casting or a shell mold casting.

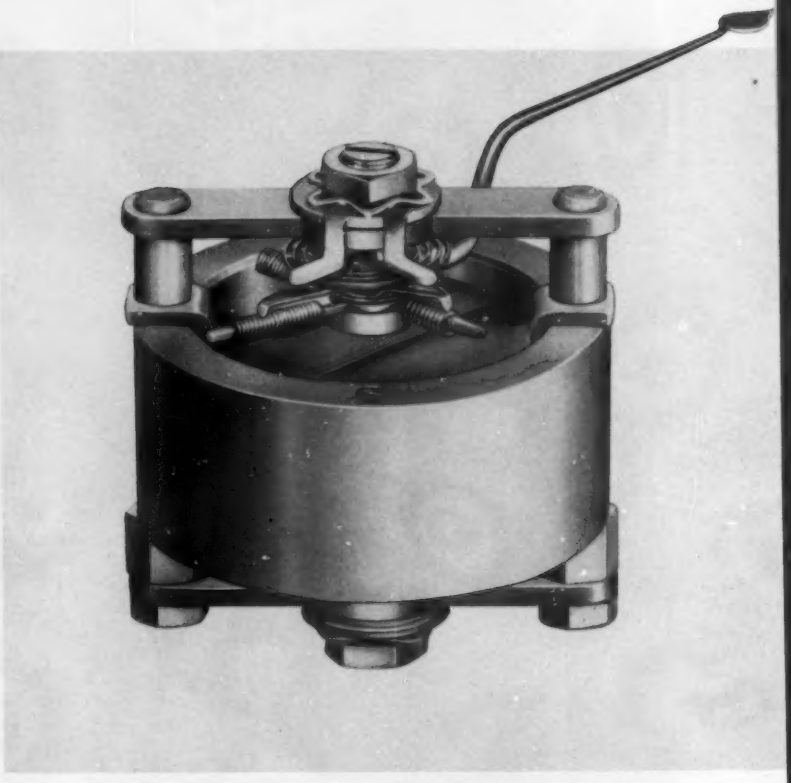
It is immediately evident that with the intricate coring involved, a casting from a green sand mold would require major machining to ready it for use. Such machining presented both an economic and a mechanical obstacle that could not be overcome.

Even if the coring could be done in a green sand mold, the rough surface that is characteristic of such castings would have so impeded the oil flow that efficient operation of the hydraulic circuit might have been subject to question.

A further objection to a green sand mold casting is the prob-

Continued on page 46

POWDER METALLURGY



COMPARISON of data resulted in a new use of powdered metal.

Continual research and development work by the powder metallurgy industry has made many new products available to manufacturers. Here is how . . .

Iron Powder Rings Replace

A NEW development in the field of meter-manufacturing which will probably make itself felt throughout the instrument and gage-making industry, has been introduced quietly by the Simpson Electric Co., of Chicago, Illinois.

Simpson, a division of the American Gage and Machine Co., has worked out the specifications of a powdered metal magnetic-return-path ring which is being installed, at the present time, in all gages made at their plant.

The ring is a necessary part of the gage assembly, encircling the dial-shaft which supports and turns the needle. It acts as a return-path conductor for the lines of magnetic force as they move from the positive to the negative pole of the instrument's permanent magnet.

Used in this way, the ring avoids leakage of the magnetic force lines and keeps the magnet operating at peak efficiency.

Since these rings, when made of SAE 1110 steel bar stock had a very high density, they were machined and installed as reliable conductors of magnetic force lines. Because the inside diameter of the bar steel was bored and ground to a close degree of accuracy, a part was produced with dimensions that were well within the closest of tolerances.

The greatest problem facing Simpson's engineers was finding a method of overcoming the lower density found in the first, experimentally made powdered metal rings. They tried many alloys, working mostly with a finely powdered iron which was infiltrated with a non-ferrous metal. Iron was chosen because of its excellent magnetic properties.

In the fall of 1956 they began working seriously with the idea of producing the powdered iron ring. Soon they were able to see that production of the part, en masse, was a definite possibility. They were encouraged by the fact that cost cuts predicted with the use of the powdered metal were very appreciable.

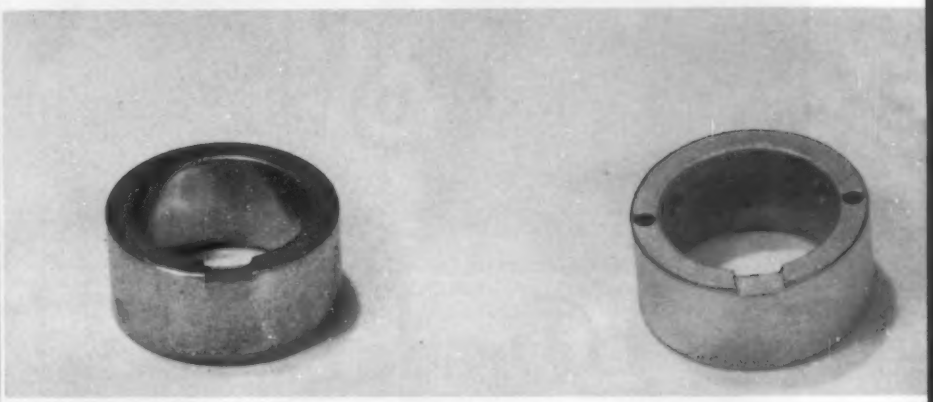
A time study was conducted on the production of ten of the magnetic-return-path rings. The next step was to begin developing a part made of powdered iron.

This went through the usual

COLD ROLLED STEEL

ADVANTAGES are high density, good conductivity.

LIMITATIONS are costs of machining, finishing bar stock, shape limitations.



SINTERED IRON POWDER

ADVANTAGES are many. Most important is the cost reduction of 50%. Fast production of close-tolerance parts, reduced finishing time and operations, and shape flexibility are listed high among others.

LIMITATIONS to be overcome include a six-percent difference in magnetic conductivity and 15% difference in densities of steel and powdered iron.

Cold Rolled Steel

stages. First the powdered metal was pressed into the specified shape. Next it was sintered to produce a part which was hardened enough to remain stable.

But there was a steady loss in magnetic force in these parts made of sintered metal. When they were assembled and placed in gages, accurate instrument-dial readings were not obtainable because of the leakage of magnetic force from the powdered iron return-path ring.

At last Simpson's engineers found the answer to the "Low Density Problem". It came about as a result of their experimenting and research.

They turned to coinage of the sintered metal parts. This process made them dense enough to meet the standards needed.

It also increased the accuracy of their dimensions. All in all, it made the rings much more efficient than the Simpson people had believed possible at the beginning of the project.

After checking and testing, it was ascertained that the final product of the research project was a magnetic-return-path ring with a density that was very close to that of steel itself. This figure was between 85% and 90% of the one listed for the metal which was used in the solid steel bar stock, the same metal from which the rings had formerly been machined.

Thus today, powdered iron magnetic-return-path rings are used as a standard part of every Simpson gage. The only machining operation still needed on the rings is the drilling of a series of holes.

The slot, which can be seen on the rim of the ring, is pressed into the part when it is sintered and coined. It was once cut into the steel part with a separate machining operation.

One problem remains: the slight difference of six percent in the magnetic force exerted through the powdered iron ring when compared to the steel ring. This is a negligible figure but Simpson's engineers want to bring the force up to that of steel. They plan to do this by experimenting with varying thickness of the ring-wall in certain areas.

In this way they can increase its conductivity of magnetic force.

Grade D-280

A new and better iron powder—Plast-Iron Grade D-280—is specially designed for producing high density sintered compacts. A modified electrolytic iron powder, Plast-Iron Grade D-280 develops a pressed density of 7.10 gms/cc at 50 tsi. Practically free of laminations. Working samples of this moderately priced new and improved pampered powder available on request.

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SHELL CORES

continued from page 43

ability of uncovering subsurface defects during machining that would cause rejection of the part.

If, however, a shell mold casting were used, practically all of the objections were eliminated. Because there is no possibility of core drift in a shell mold, the accuracy of the part is assured and this accuracy can be repeated from piece to piece. Because the cores and mold parts are rigid and firmly bonded it is possible to use much thinner sections without danger of mold collapse prior to or during pouring.

Cored Hole

A cored hole, in which the valving mechanism operates, passes through the entire governor body. Here, again, the superiority of the shell mold process is evident since the required accuracy could not be achieved with a normal sand core.

The intricate maze that must be provided for oil flow could not be machined at a cost that would permit the use of this device in automotive applications. To secure the thin channels and the bottom shape required called for rigid mold sections. This was solved by the shell mold process without difficulty, whereas with a green sand mold the occurrence of collapse or wash resulted in large numbers of rejected castings. This was costly.

Less Machining

As is evident from the illustration, all expensive and intricate machining has been eliminated. Boring, drilling, facing and turning are the only operations that must be done. All of these are quite inexpensive and are readily amenable to full or semi-full automatic operations.

The reproducibility from casting to casting is so good when shell molds are used that machining allowances of only 1/32" are necessary. Blow holes, inclusions, porosity and other defects common to the grey iron castings are almost completely absent.

With the methods of production now in use, the Central Foundry Div. of General Motors Corp. produces over 100,000 governor body castings per month — a production record that would be impossible to meet by any fabricating method other than one of the precision casting processes.

DISCUSSION at each design-clinic was led by qualified members. Slides showed design standards.

PANELS displayed "Products Standards for Die Casting" in Engineering, Commercial, Metallurgical fields.

INTEREST in unusual features, applications, alloys and finish is seen in candid display-area shot.

COMPARING die casting process with others in displays, visitors see advantages of die-cast TV frames.

DIE CAST components of dental chair include housings, small fittings. Note fine finishes on aluminum.

VISITORS inspect variety of die castings. ADCI experts answered questions about die castings and process.

DIE CASTERS STAGE REGIONAL DESIGN CLINICS TO HELP . . . .

If You're Considering Die Castings

ATTENDANCE at one of these American Die Casting Institute sponsored clinics gives engineers, purchasing people and executives an opportunity to bring their problems before experts. Further, the displays of die cast products in aluminum, brass, magnesium and zinc can be a source of ideas that may lead to wider use of die cast components and lowered production costs. A feature of every clinic is the showing of the American Zinc Institute's film; "Die Casting, How Else Would You Make It?"

DATA OFFERED IN THIS MONTH'S ADS

the Reader Service Cards on the facing page will get you these free reference materials. Circle the numbers and mail.

2. 1,000 Shots per Hour — according to bulletin A-10, an engineering report on small die casting machines from ABC Die Casting Machine Co.

5. Alloy Metal Powders — The use of these powders in the fabrication of parts, and the properties of these parts, are covered in detailed reports from Alloy Metal Powders, Inc.

7. Die Casting Machines — A complete descriptive folder is offered by American Die Casting Machinery Co. which explains their line of die casting machines and their installation and operator training services.

11. Investment Castings — Full details are available from Austenal, Inc. on a vacuum melting method for the high-temperature field to cast alloys not previously available. Also offered is a booklet describing the "Microcast" process.

12. Plunger Rings — Complete information on hardened steel plunger rings which last as long as 122 days is available from The Auto-Diesel Piston Ring Co.

13. Investment Castings — Literature from Alloy Precision Castings Co. gives useful information on designing, specifying, and buying investment castings. The company's plant and techniques are also described.

15. Casting Waxes — Complete information is available from M. Argueso & Co., Inc. on "Cerita" casting waxes custom made and quality controlled to individual and unique specifications.

17. Induction Heating — A 20-page book from Ajax Electrothermic Corp., entitled "Dr. Northrup's Wireless Furnace" tells the story of induction heating and its applications throughout American industry.

18. Die Casting Machines — A new brochure from B & T Machinery Co. discusses the latest and best developments in die casting equipment. Hot and cold chamber machines for zinc and aluminum, are described.

19. Sintered Powder Products — A 24-page engineering handbook from Bunting Brass & Bronze Co. describes sintered powder products and their composition, manufacture, and application.

21. Safety Hydraulic Fluids — Form 40134 from Carbide & Carbon Chemicals Co. describes fire resistance, anti-wear characteristics, and corrosion protection of their "CP"-type hydraulic fluids.

22. World's Largest — commercially-built die casting machine is described in a specification sheet from Cast-Master, Inc. A brochure on other models is also available.

23. Fire-Resistant Hydraulic Fluids — Complete data from Celanese Corp. of America describes fire-resistant hydraulic fluids available in as many as six controlled viscosities.

24. Automatic Injector — The first completely automatic industrial injector for wax or plastics is described in Bulletin No. 1202 from the Centrifugal Casting Supply Co.

26. Custom Alloys — A 6-page handbook for metallurgists offered by Cannon-Muskegon Corp. gives complete data on their "UltraMet" and "Master-Met" alloy service.

27. Powder Metal Parts — Detailed information from Chrysler Corp., Amplex Div. describes their line of powder metal components — "Oilite" bearings, parts, and filters.

28. Die Casting Machine — Bulletin 600 from The Cleveland Automatic Machine Co. describes their new 600-ton die casting machine. It can be used with a hot chamber shot end or converted to a cold chamber machine if needed.

29. High-Vacuum Furnace — Bulletin No. 4-30 from Consolidated Electrodynamics Corp. gives complete specifications, accessories, and design features of a high-vacuum furnace for either laboratory or production.

30. Special Steels — A publications catalog offered by Crucible Steel Co. of America lists information available on their stainless castings and other special steels.

32. Investment Castings — Catalog 120 from Casting Engineers, Inc. describes cost reductions through a new approach to investment casting.

33. Die Cavity Sets — A 12-page brochure from Detroit Mold Engineering Co. gives complete prices and specifications on six new standard sizes of cavity sets for die casting.

34. Universal Tester — Brochures from W. C. Dillon & Co., Inc. describe a universal tester to operate in tension, compression, transverse or shear. The unit is designed for materials up to 125,000 psi tensile.

37. Investment Castings — Descriptive literature is available from Gray-Syracuse, Inc. on the production and use of investment castings.

38. Small Die Castings — A fact-filled bulletin from Gries Reproducer Corp. explains their "Intercast" method of producing zinc-alloy units with moving elements in a single operation which is automatic.

39. Briquetting Presses — Design and engineering data sheets are available from Haller, Inc. on their hydraulic and mechanical briquetting presses built for speed, accuracy, and economy.

41. Investment Casting Design — A brochure has been published by Hitchiner Mfg. Co. to aid the engineer in designing for the best and most economical use of investment castings.

40. Zinc Base Alloys — An informative reference booklet from Henning Bros. & Smith, Inc. discusses how their "Zamak" alloys produce better results at lower cost.

46. Refractory Mold Materials — Literature is available from Harbison-Walker Refractories Co. on mold materials that feature a uniform coefficient of thermal expansion up to 2400 F, higher fusion point, and other advantages.

Continued on page 72

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12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306

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9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299
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Finishing Section

The specialized finishing methods, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here. This includes all secondary operations which convert a raw casting to a finished product.

For a gleaming finish, ball burnish in a barrell.

see page 51

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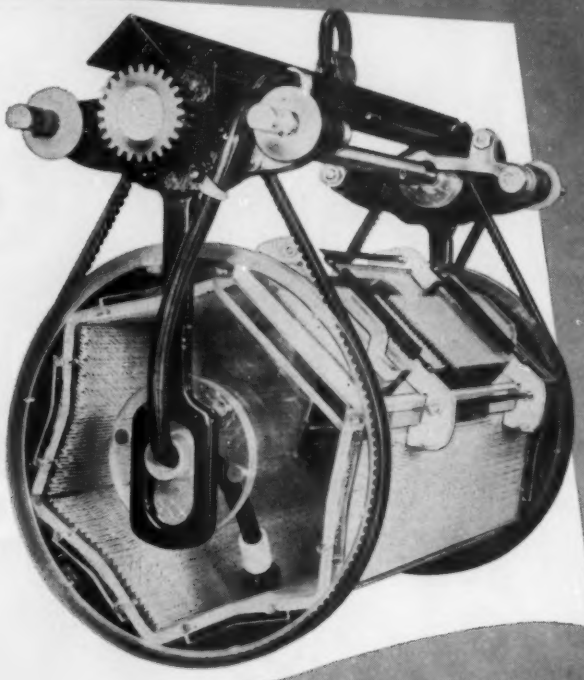

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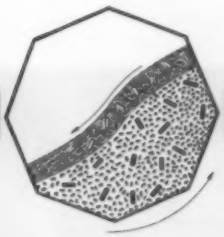


Ball Burnishing In A Barrel

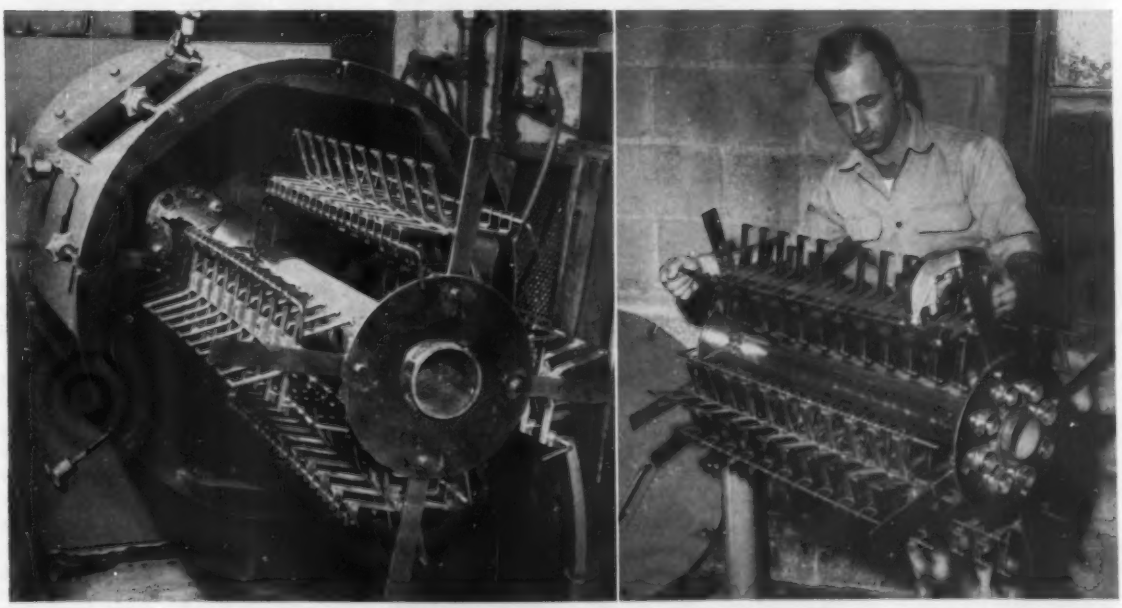
THE use of barrel finishing methods for polishing die castings has become a well established procedure. Adequate equipment is currently available to handle small parts that can be charged loosely into a barrel or relatively large parts that can be racked and then polished in special equipment, generally quite large units.

The need existed, therefore, for a method of barrel finishing die cast parts of an intermediate size, especially aluminum base alloy castings. Because these parts are seldom either plated or painted the surface finish must be as nearly perfect as possible. Hand polishing can not be used since this would, to a large degree, defeat the purpose of using a die casting; i.e., the production of a quality component at low cost, and areas inaccessible to buffing equipment would still not be polished.

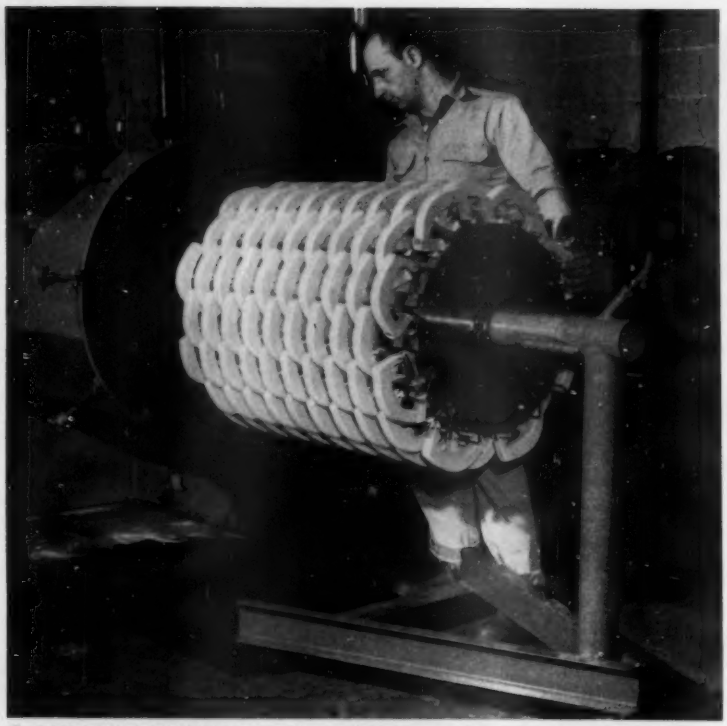
Further, the advent of new casting techniques may soon make the production of aluminum die castings as rapid as the production of zinc castings. This will impose an additional burden on the finishing department.

A newly developed barrel finishing method that has been perfected by the Roll Brite Corp., of White Plains, N. Y., may be the answer to the need for a high speed barrel finishing procedure which will polish aluminum and zinc die castings at speeds comparable to the casting speeds and will give a high quality finish that does not need any subsequent hand work to complete it.

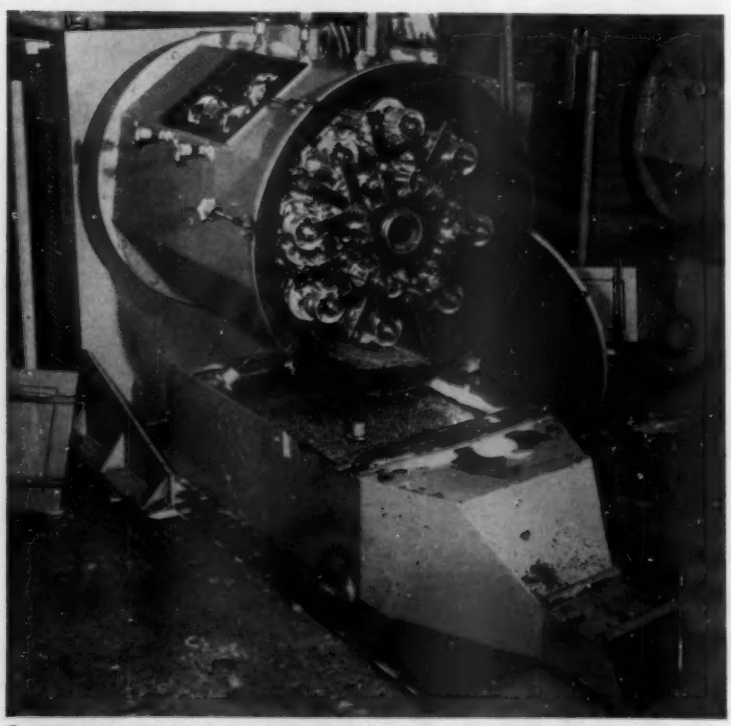
Briefly, the new process utilizes power driven racks in medium sized barrels. Costs of material for



1 POSITIVE SLIDING ACTION of the steel balls over every surface is insured by properly racking the die cast parts and by rotating the barrel and the parts in counter-current manner. At the left is a typical fixture rack to be loaded with castings. When possible, cored holes and lugs are used for holding. On the right the cups that fit over the drive studs in the rear of the barrel are shown.



2 OVER TWO HUNDRED portable tool parts are shown here, positioned on the rotatable rack and ready to be put into the barrel. The direction of rotation will be periodically reversed to eliminate flow marks.



3 THE BALL CHARGE from this load has been discharged and the burnished parts are ready for removal from the barrel. The small door in the side of the barrel is used for charging and discharging balls, water and compound.

processing are relatively low. The finish produced is highly acceptable for almost all uses to which aluminum die castings are put. It is very bright and attractive.

Because there is no grinding or etching action, there is substantially no dimensional change during polishing. All decorative details are preserved. However, the crest of threads may be slightly dulled without any change in thread fit. Close tolerance holes are masked during chemical preparation, permitting machining prior to Roll Brite processing. There is a complete absence of peened appearance since only a sliding motion is used.

The secret lies in the proper design of the racks, permitting handling of a barrel load as a unit, and the use of a reverse direction of rotation for half of the polishing cycle. The polishing material is steel balls or cones and, while the need for graded size can be visualized, up to the present time there has been no job encountered that was not successfully handled with ¼" diameter balls and cones.

The direct drive of the rack is accomplished by a multiple lug drive at the back of the barrel as shown in figure 1. At the back of the barrel shown on the left can be seen a part of the drive ring of eight lugs. The rack is supported on a central shaft and mating receptacles on the back of the rack provide a strong, positive drive. The illustration (figure 1) shows these drive receptacles.

Figure 1 also shows how specially designed racks are used to position the parts to be polished. Wherever possible, cored holes and the various fastening and locking devices that have been incorporated into the casting are utilized to hold the parts on the rack. This insures that no portion of the casting that should be polished is partially covered by a mounting bracket.

Naturally, thorough cleaning and degreasing are essential prior to barrel finishing. This chemical procedure is:

1. Solvent degrease if this is necessary.
2. Clean in hot caustic for about 5 seconds at 190 F.
3. Rinse in cold water.
4. Acid dip for 15 to 30 seconds at room temperature.
5. Rinse twice in cold water.

6. Rinse in hot water and dry.

A degreasing and cleaning cycle as outlined above will give a surface that responds excellently to ball burnishing. All of the very fine burrs will be removed and the surface will be spot free.

Following cleaning the die cast parts are loaded on the racks as shown in figure 2. Here over 200 handles for portable tools are racked for polishing in a 3' x 3' octagonal barrel. These barrels are generally neoprene lined for long service life.

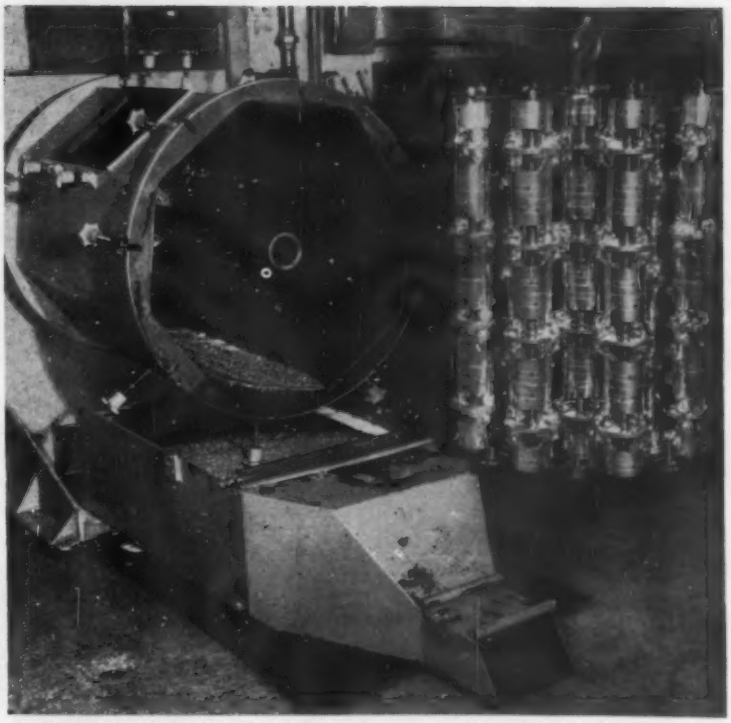
After the loaded rack has been placed in the barrel and the end fastened in place, the ball charge is added through a charging door on one of the sides. Water and compound are added to fill the barrel and complete the charge.

There are several features here that are noteworthy. The entire end of the barrel is removed for charging and discharging of the loaded rack. With properly designed dollies this becomes a simple, one man operation. Both charging and discharging of the ball load is through the side door. Discharge is into a specially designed pan that holds the balls and allows the water to drain away. This same pan is later picked up by an overhead crane and serves as a funnel for recharging balls.

The simple addition of water and compound, and sealing of the ball-charging door prepares the loaded barrel for rotation. The speed of rotation is variable and has a wide latitude for most parts. Complete cycle time varies with parts processed, and approximates one hour. During operation, the barrel is rotated in one direction for one-half of the required time and then reversed for the balance of the time.

After polishing the parts are removed from the barrel, rinsed in cold water and then in hot water and allowed to dry. A load ready for removal from the barrel is shown in figure 3, after removal and ready for rinsing in figure 4 and finally the finely polished parts being removed from the rack in figure 5.

Such simple operation is the result of long-time investigation, and complex engineering problems have been answered by the "Roll Brite" technique which at first glance appears to be easily conceived and developed.



4 **AFTER BURNISHING** the castings have a smooth bright surface, but must be thoroughly rinsed in cold and then hot water. The bright surface created by the process will remain long after the tool is in the hands of the purchaser.

5 **POLISHED AND DEBURRED,** these castings are ready for assembly. The bright finish is permanent, all burrs have been broken off or rolled over. Even fine threads are not damaged by this burnishing process.

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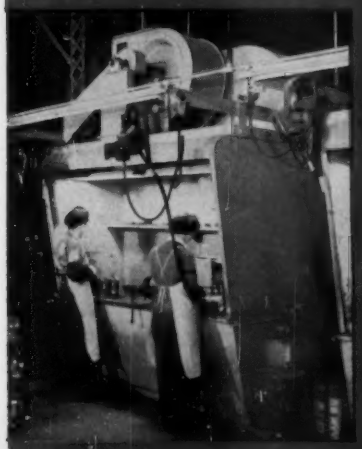

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Illustrated here are four types of PD Wet Type installations. *Upper left*—well ventilated bench for the safe collection of dust produced from portable tool and flexible shaft grinding, polishing and buffing; *upper right* — dust collector for grinding stands and polishing jacks; *lower left* — water-wash type spray booth for removing noxious fumes created while spraying oxidation inhibitors containing fluorides or other toxic compounds on cores; *lower right* — high velocity side hood wet collector for dust, fumes and smoke during a foundry "shakeout" operation.

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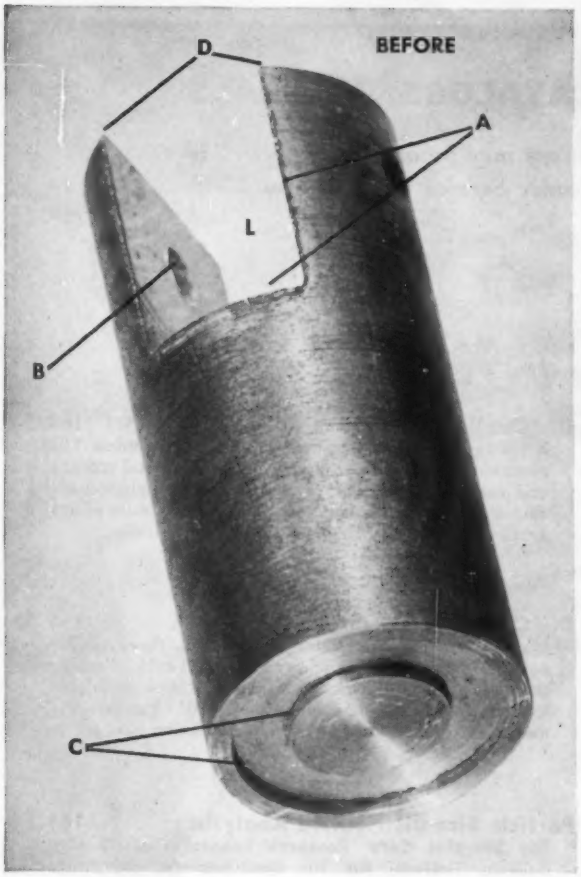
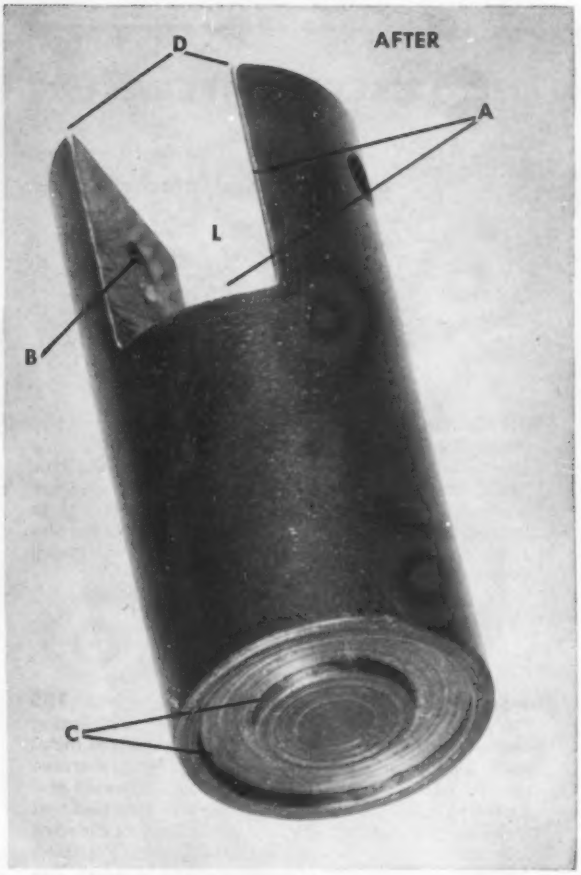
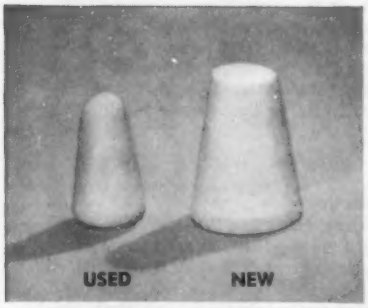




This critical barrel finishing problem solved with "HONITE" Brand CeramiCones



AFTER 550 HOURS use the CeramiCone left retains its exclusive truncated cone shape. Every part of each chip is a working surface—and they're next to diamonds in hardness.

Controls Company of America, Soreng Division, had a major problem in the barrel finishing of mild steel solenoid plungers. Removing milling burrs (A), piercing burrs (B), and burr removal and corner break at (C) with conventional barrel finishing chips was causing much lodging of chip particles in the finished plunger. Two full-time additional inspectors were required to remove these particles.

The company—a leading producer of solenoids—found that a chip large enough to avoid lodging at (C) would lodge in milled slot (L) or would peen corners (D). Too small a chip would fail to remove burrs (A) or would lodge in pierced holes (B).

A "HONITE" Engineer solved this company's problem with CeramiCones—the amazing new precision-molded chips made of high-strength, non-crystalline ceramic. Results: CeramiCones stopped lodging *anywhere* and the additional inspection operation was discontinued. Finishing costs per thousand plungers dropped to ½¢ with improved surface finishes, impingement and nicking was eliminated, and because of faster burr removal the time cycle was cut ⅓ with improved corner break.

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PMM USEFUL LITERATURE, CATALOGS, MANUALS

any of these technical publications may be obtained by circling the appropriate numbers on the Reader Service Cards, Pages 48-49

PMM PROCESSES

Steel Castings: 154
Dodge Steel Co., 8-page quarterly bulletin. Valuable tips to buyers of steel castings are contained in the spring issue of the "Dodge Steel Ladle." Included are illustrated articles on the company's steel castings in service, photos of castings for varied applications, and notes on how products are improved through using better castings.

Powder Metallurgy Handbook: 155
The Bunting Brass & Bronze Co., 24-page engineering handbook. The manufacture and use of powdered metal parts as revealed by experience and comprehensive research is described in detail in a newly-issued engineering handbook. Among the subjects discussed and elaborately illustrated are "Sizing the Bore of Sintered Bearings", "Good Design vs. Poor Design Practice", "Secondary Machining Operations and Special Requirements", "Dimensional Tolerances", plus data on sealants, carburizing or carbo-nitriding use with die castings, and other subjects.

Casting Facilities: 156
Gaines Co., 6-page booklet. The company's operations and equipment in all departments — green sand molding, dry sand, shell mold, permanent mold, semi-permanent mold and centrifugal casting, a newly installed tool and die shop and production machine shop — are described. Growth of the company to its position as second largest light metals foundry on the West Coast is traced.

Die Casting Products, Services: 157
Gries Reproducer Corp., 9-page bulletin. Sixty-seven different types of zinc alloy die cast and thermoplastic molded products made by the company are listed. Also outlined are services offered on special orders.

Steel Casting: 158
Lebanon Steel Foundry, 4-page bulletin plus reprint. The production of close-tolerance steel castings by the low-cost "Ceramicast" process is described and illustrated. Quality advantages, cost advantages, versatility, and applications of the process are discussed.

MATERIALS & EQUIPMENT

Die Coatings, Fluxes: 159
Atlantic Chemicals & Metals Co., 6-page folder. The company's line of fluxes and coatings for metal melting and casting is described and illustrated. Included are fluxes for the metals: zinc, aluminum, aluminum alloys, brass and bronze.

Die Casting Accessories: 160
Martin Grinding & Machine Works, Inc., three single-page bulletins. The company's line of cold chamber sleeves, plunger stems, and plunger tips available from stock is described and illustrated. Complete dimensions, prices, and delivery information are given.

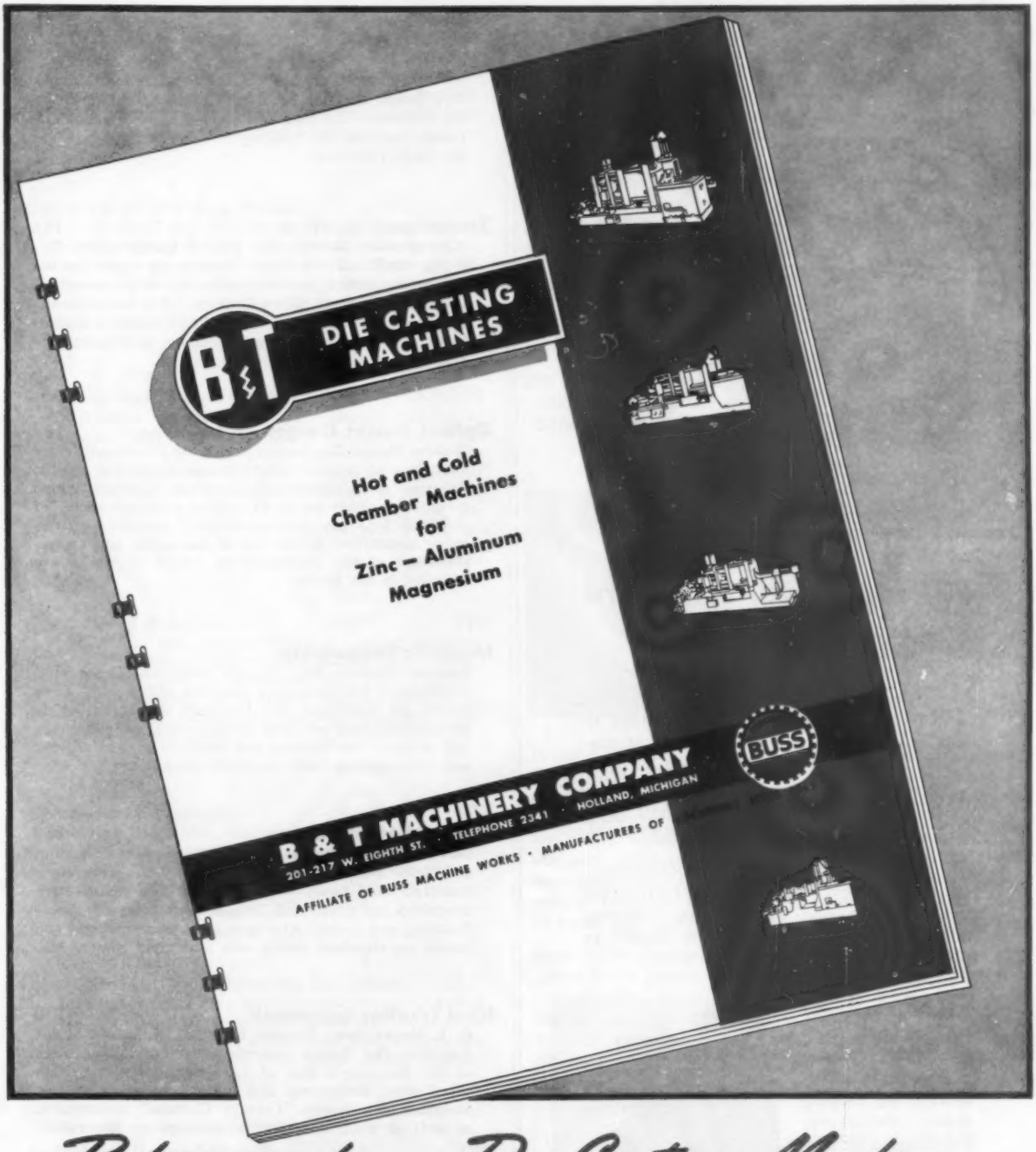
Particle Size Distribution Analysis: 161
The Sharples Corp. Research Laboratories, 10-page bulletin. Bulletin No. 101 describes the company's micromerograph, designed to give rapid, accurate, reproducible particle size distribution analysis. The unit is illustrated, and its principle of operation, advantages, and important features are discussed.

Carbide Powders: 162
Allegheny Ludlum Steel Corp., data sheets. A series of 15 "Blue Data Sheets" on the company's line of "Carmet" carbide grades gives typical applications, analysis, physical characteristics, and photomicrographs showing the grain structure of the powders. Included is a series of charts giving information on transverse rupture, electrical conductivity, and resistance to abrasion.

Millivoltmeter Recorder: 163
The Bristol Co., 4-page bulletin. Bulletin No. E1117 describes the use of a new millivoltmeter recorder in surveys of electrolytic corrosion and deterioration of underground structures such as pipes and cables. A bibliography on actual testing methods and their significance is included.

Colloidal Dispersions: 164
Acheson Colloids Co., 4-page product bulletin. A new edition of the company's bulletin " 'dag' Dispersions for Industry" lists 44 colloidal and semi-colloidal dispersions of graphite, molybdenum disulfide, mica, vermiculite, zinc oxide, acetylene black, copper, and glass. Carriers and diluents are given for each product, along with typical applications and important physical data.

Continued on page 58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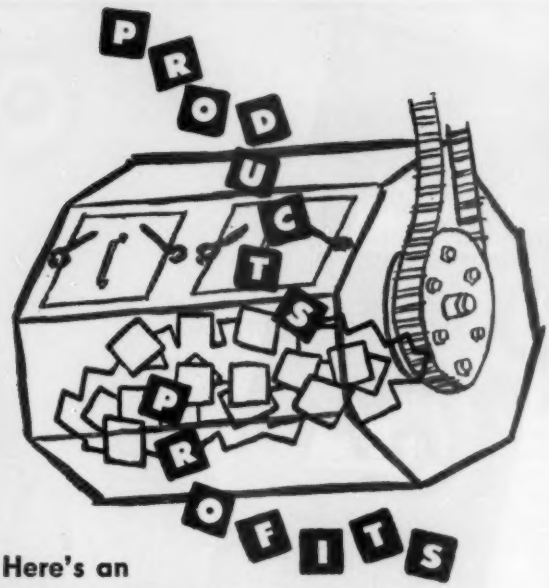

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TAKE your profits out

One of the greatest money-saving opportunities in metal-working lies in the use of barrels to finish parts by the hundreds in place of conventional methods that finish one part at a time.

Barrel finishing makes easy work of many tough jobs of grinding, deburring and buffing by wheel.

One Oakite customer changed to barrel methods to deburr curved stainless steel strips that are 14 inches long. The cost for deburring 20,000 strips was reduced from $3,000 to $125.00.

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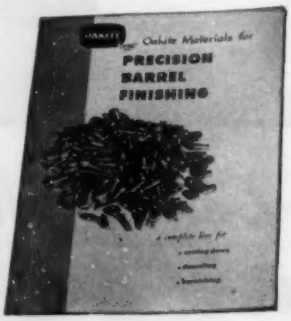


OAKITE

Export Division
Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

For more information circle No. 103 on the Reader Service Card

Silicon Carbide Heating Elements: 165
The Carborundum Co., Globar Div., 12-page reference booklet. Form A-1472 entitled "Hot Tips" covers important information on handling, unpacking, storage, installation, and replacement of silicon carbide heating elements. The booklet comes in an convenient envelope designed for hanging on wall next to furnaces for ready reference.

Zirconium Properties: 166
Carborundum Metals Co., Div. of Carborundum Co., 8-page technical brochure. Zirconium's corrosion resistant properties receive authoritative treatment in the second issue of "More Zr Facts." The brochure includes a discussion of the uses of zirconium in various types of atomic reactors and chemical processing applications of interest.

Optical Height Gauge: 167
Webber Gauge Co., 6-page folder. An illustrated folder describes an optical height gauge developed by the company as a "fantastically accurate yardstick which measures heights up to 61 inches with accuracies of ±.000005 inch per inch of height." A complete, detailed description of the use of the gauge and an explanation of the principles on which it works are included in the folder.

Magnetic Engineering: 168
General Electric Co., 12-page brochure. Three vital functions of the company's magnetic engineering laboratory are described. The brochure covers the engineering activities required in evaluating magnetic circuit designs, establishing test methods and standards, and investigating basic magnetic phenomena.

Standard Mold Bases: 169
Detroit Mold Engineering Co., 12-page specification and price bulletin. Six new sizes of the company's standard mold bases — up to 23¾ x 35½ inches — are described and illustrated. Included are complete specifications and prices. Also given are specifications and prices on standard cavity sets and mold plates.

Heat Treating Equipment: 170
C. I. Hayes, Inc., 12-page bulletin. Bulletin No. 461 describes the design advantages and available sizes of the company's line of hardening, pre-heat, high speed steel, tempering, and vertical furnaces. It also describes the Hayes "Certain Curtain" atmosphere, as well as their endothermic atmosphere generators.

Zirconium Bibliography: 171
Columbia-National Corp., 7-page bibliography. What is believed to be the most complete and up-to-date source material available on properties of zirconium and its alloys is given in a recently-released bibliography. Included are titles from major books, pamphlets, and articles in trade magazines published since the year 1950.

Spectrochemical Analysis: 172
Jarrell-Ash Co., 24-page technical brochure. Bulletin No. CH402, the second in a series of five publications dealing with various aspects of spectrochemical anal-

ysis, describes the design and applications of a variety of excitation source units and discharge stands. Published by Hilger & Watts Ltd. of England and distributed in this country by Jarrell-Ash, the brochure offers detailed specifications of arc and spark units, stands, attachments, and accessories available for both direct reading and photographic analysis.

Compression Molding Presses: 173
F. J. Stokes Corp., Plastics Molding Equipment Div., 12-page catalog. Catalog No. 200 describes and illustrates the company's redesigned Model 741 series fully-automatic compression molding presses. Complete specifications are given for the four models in the series — 50, 75, 125, and 200 ton capacity.

Non-Lubricated Bearings: 174
Electro-Nite Carbon Co., 16-page catalog. Non-lubricated bearings made from carbon graphite, which operate under very high temperatures, are chemically inert, and have overcome many maintenance problems for industry, are described. Applications in ovens, process equipment, and conveyors are illustrated. Included are nomograph charts, grades, and design information of interest.

Die Casting Machines: 175
E. M. B. Co., Ltd., illustrated folder. Catalog M346 describes the company's line of hot and cold chamber die casting machines for aluminum and zinc. The machines' compressed air operated injection systems are discussed, and advantages explained. Complete specifications are included.

Comparator Gauges: 176
Freeland Gauge Co., illustrated folder. The company's Model L air comparator gauges are described and illustrated. Outstanding features are discussed, and operating principles, working components, and calibration are explained.

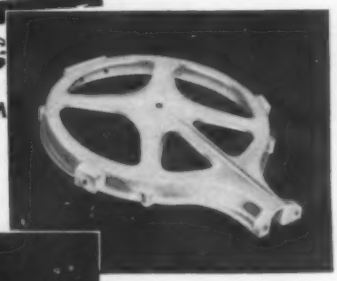
Refractories Manufacturing Facilities: 177
The Carborundum Co., 28-page company magazine. A recent issue of "Carborundum News" is entirely devoted to the company's Refractories Div. History and growth of the division is traced, and present facilities and products are discussed.

Industrial Dehumidification: 178
Abbeon Supply Co., 6-page bulletin. Bulletin 496 gives detailed facts on dehumidification for industrial plants, warehouse, stockrooms, laboratories, and home requirements. Included are descriptions and illustrations of dehumidification equipment available.

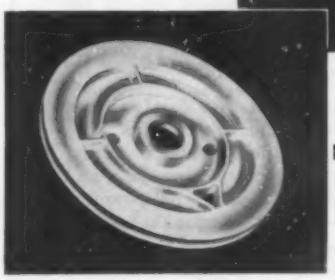
Aluminum Alloy: 179
Apex Smelting Co., file-size brochure. The company's aluminum alloy 417, which has been tested, approved, and widely accepted by industry, is described. The brochure gives the chemical composition, typical properties, government specifications, applications, and other facts about the alloys.

Continued on page 60

ALUMINUM DIE CASTINGS for OUTBOARD MOTORS — Important Factors In Their Increasing Popularity



DIE CAST ALUMINUM OUTBOARD MOTOR STARTER HOUSING



DIE CAST ALUMINUM OUTBOARD MOTOR STARTER PULLEY

Literally, 101 applications are found for the use of aluminum die castings — ranging from the starter on top, down to the propeller — on today's dependable lightweight outboard motors. Unquestionably the use of aluminum die castings has played a major role in making practical the increasing use and enjoyment of outboard motors by millions of Americans. Their advantages are many: great savings in weight, corrosion resistance and minimum of machining required for finishing.

Note in the photograph above, the inclusion of mounting bosses in the castings which reduces assembling costs. The starter pulley, by LITEMETAL, shown above, includes the addition of brass inserts to afford greater wear resistance. Why not consult our designers . . . whatever your field of manufacture.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

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PLANT AND EXECUTIVE OFFICES

For more information circle No. 57 on the Reader Service Card

CENTRIFUGAL CASTING NOW IDEAL FOR CLOSE-TOLERANCE, HIGH-PRODUCTION WORK

By F. S. Ross, Vice-President in charge of Engineering Centr-O-Cast and Engineering Co.

Up to a few years ago, the centrifugal casting process was employed primarily to manufacture such items as bronze bushings and cast iron soil pipe . . . items that were either machined in their entirety or destined for applications where finish and accuracy were not important. However, centrifugal casting techniques began to improve with the experience gained casting bronze for armaments and railroad equipment. More accurate castings became possible, and faster production machinery developed.

The inherent good qualities of centrifugal castings had long been recognized: denser structure, more homogeneous mass, higher yield. For high-quality, low-production parts, the process was ideal, and it was felt that this type of casting would eventually dominate in any application where consistent quality was a prerequisite. The only drawback had been high production cost. Now, as older, slower foundry methods were replaced by efficient techniques and equipment, that drawback was removed.

Over the years, through re-design and improvement of centrifugal machinery, we at Centr-O-Cast have mechanized the centrifugal process to the point where we are selling at a cost comparable to die casting, with all the excellent properties of a permanent mold casting. No longer is the centrifugal process a backward method; its close tolerances, coring of holes, and interchangeability are now widely accepted by engineers.

On one particular part which we recently produced, the dimensional accuracy of the centrifugal casting was such that the parts were interchangeable with die castings. The die costs in the centrifugal method were one-third those of the die casting, and the resulting product was superior.

We can now say that our product has the accuracy of a die casting combined with the good physicals of a permanent mold casting. Because aluminum is so well suited to centrifugal and permanent mold casting, we are able to produce light, low-cost, easily machined parts for appliances, or for the aircraft and automotive industries, where light weight is increasingly important.

centr-O-cast

AND ENGINEERING COMPANY

45 St. Jean Avenue • Detroit, Michigan

54

End Mills: 180

Detroit Mold Engineering Co., illustrated folder. Redesigned end mills, made especially for mold makers by The Cleveland Twist Drill Co. and distributed by DME, are described and illustrated. Included are sizes available, prices, and ordering instructions on nine different designs.

High Vacuum Equipment: 181

NRC Equipment Corp., 16-page product index. A recently-issued price list and product index covers more than 400 items of industrial and laboratory high vacuum equipment including standard components, packaged systems, and engineered plants. Listed are oil and mercury diffusion pumps, rotary gas ballast pumps, mechanical booster pumps, vacuum gauges, seals and valves. Standard systems include analytical equipment, vacuum melting furnaces, crystal pulling furnaces, freeze drying equipment, leak detection equipment, metallizers and portable pumping systems.

Shell Mold Parting Agents: 182

Dow Corning Corp., 4-page instructional leaflet. Proper procedure for using silicone parting agents in shell molding are outlined in Bulletin No. 5-116. Special sections are devoted to the most effective methods of breaking-in and cleaning patterns. The relative advantages and limitations of all types of agents are discussed, including compounds, emulsions, and various solvent solutions.

Zirconium Hafnium Data: 183

U. S. Industrial Chemicals Co., Div. of National Distillers Products Corp., 12-page booklet. The uses of zirconium and hafnium, their mechanical and physical properties, and U.S.I.'s sodium process for producing the metals are described and illustrated. Data is also given on zirconium alloy systems and the fabrication of zirconium parts.

Temperature Monitoring Systems: 184

Thermo Electric Co., Inc., 8-page bulletin. Bulletin No. 72 describes the company's temperature monitoring systems. Standard sub-assemblies and their arrangement into integrated systems are discussed in detail. Individual components are illustrated and diagrams show how they can be adapted to individual needs. Complete information is also given on operational details, specifications, applications, optional equipment, temperature ranges for thermocouples and resistance bulbs, and the various types of signaling devices used.

Ultrasonic Test Equipment: 185

Arenberg Ultrasonic Laboratory, Inc., 4-page bulletin plus price list. Basic equipment units in the 600 series — a high power ultrasonic pulsed oscillator, a narrow band tunable pre-amplifier, a wide band amplifier, and calibrated attenuators — are described and illustrated. Design features and complete specifications are given.

Water Demineralization: 186

Enley Products, Inc., 6-page brochure. Improved ion-exchange water purification techniques and equipment are discussed and illustrated in an informative gatefold brochure. Included is an all-plastic unit for producing high-purity demineralized water. The units are available in various sizes with a variety of connective fittings.

Standard Thermocouple Assemblies: 187
Claud S. Gordon Co., 4-page bulletin. Bulletin No. TA-457 describes and illustrates a wide variety of "Serv-Rite" thermocouple assemblies now available. Included are catalog numbers, sizes, prices, and ordering information.

FINISHING

Electrolytic Grinders: 188
Hammond Machinery Builders, Inc., 4-page bulletin. Bulletin No. 238 describes the company's new oscillating and chip breaker grinders. Advantages of electrolytic grinding are explained. Standard equipment and specifications on all models are given, plus specifications for grinding wheels.

Tapping Attachments: 189
Ettco Tool & Machine Co., Inc., 6-page bulletin. Bulletin No. 22A describes and illustrates the construction, physical characteristics, and applications of a complete line of tapping attachments which quickly fit on any drill press. Claimed to be the only high-speed sensitive tapping attachments which run in oil, they are available in capacities from #0 to ¾ inches. Available accessories are also described.

Burnishing Material: 190
Oakite Products, Inc. Complete information is available on "FM-103," a burnishing material designed for use with all types of barrel finishing media or with self-tumbling work. It is said to produce a smoother, brighter finish, prevent tarnishing during burnishing, rinse freely, and is economical in use.

continued on page 62

Stop Aluminum Corrosion!
Insure Paint Adhesion
Provide Ornamental Finish

TURCOAT 4178
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DOES ALL THREE!

Immediately non-smearing
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Meets Government Specification MIL-C-5541
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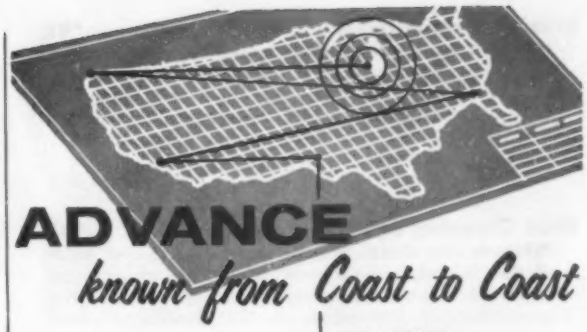

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36 years of service to industry

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Brazing Applications: 191
Handy & Harman, 4-page bulletin. A recent issue of the company's "Low Temperature Brazing News" describes some applications of silver alloy and aluminum brazing compounds. Eight case histories are discussed and illustrated.

Blast Cleaning Equipment: 192
Wheelabrator Corp., 8-page bulletin. A recent issue of the "Wheelabrator Digest" gives case histories on wide use of airless blast equipment. Featured is the application of automation to the cleaning of heat treated automotive gear components.

Stainless Steel Machining: 193
The Carpenter Steel Co., pocket-size chart. A wealth of the latest information on the machining of popular grades of stainless steel is given on a pocket-size slide chart. Concise data on turning, drilling, tapping, threading, milling and reaming is given, plus a chart showing the relative workability of stainless steels in a wide variety of operations.

Centrifugal Collectors: 194
Kirk & Blum Mfg. Co., 6-page folder. Two new design types of centrifugal collectors are described and illustrated, and a wide range of industrial applications for each in efficient air cleaning and dust collection is discussed. Complete specifications for the 41 sizes of collectors are included, as well as dimensional drawing of the items.

Reference Data from the MPA Show

(As a service for those who could not attend the show, here's reference material that was available. For your copy, circle the appropriate number on the Reader Service Card.)

Sintered Stainless Steel Parts: 214
Alloy Metal Powders, Inc., 4-page technical bulletin. Operational steps in producing sintered parts from stainless steel powder are explained, with tables of powder properties, analyses, and available grades given.

Metal Powders: 215
The American Metal Co., Ltd., 10-page technical brochure. Handbook No. C-14 gives a brief history of the powder metallurgy process, and describes the different metal powders available from the company. Specifications are charted.

Dielectrics, Ultra-Violet Light Absorbers: 216
Antara Chemicals Div., General Aniline & Film Corp., two technical bulletins. A 16-page bulletin describes the company's "Polectron" dielectrics for use in communications at high temperatures and frequencies. A 20-page bulletin gives detailed technical information on four "Uvinal" ultra-violet light absorbers.

Carbonyl Iron Powders: 217
Antara Chemicals Div., General Aniline & Film Corp., three technical bulletins. A 32-page technical data booklet gives complete information on six types of carbonyl iron powders, designated types SF, TH, E, C, HP, and L. Two additional eight-page bulletins give information on carbonyl iron powder types GQ-4 and GS-6.

. . . an important announcement in the aircraft field

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● THE FIRST BOOK dealing with hydraulic component and system design for high-speed piloted aircraft and missles, AIRCRAFT HYDRAULIC DESIGN has been written by a leading aircraft engineer. Developed from practical and theoretical material, the book develops many basic equations including those relating pressure gradient, flow-path dimensions, flow rate, velocity, fluid density, and viscosity.

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Magnetic Materials: 218

The Arnold Engineering Co., Sub. of Allegheny Ludlum Steel Corp., 26-page reference bulletin plus price list. Technical information is given on magnetic material components in Bulletin No. GC-106B. Included are descriptions and bibliographies on permanent magnets, silectron cores, tape wound cores, tape wound bobbin cores, iron powder cores, and molybdenum permalloy powder cores.

Sintering Furnaces: 219

Drever Co., 12-page bulletin. Bulletin No. B-101 describes the company's line of furnaces for sintering powder metal products and the reduction of metallic oxides.

Furnaces, Atmosphere Data: 220

The Electric Furnace Co., two reprints, 6-page bulletin, plus chart. "Basic Furnace Atmospheres and Composition Effects" and "Endothermic Atmosphere for Heat Treatment of Steel" are topics of two technical articles available in reprint form. Bulletin No. 461 describes gas fired, oil fired, and electric furnaces for any process, product or production. A special atmosphere chart on an 8½ x 11 sheet is also offered.

Copper Alloy Powders: 221

Federal Mogul Div., Federal-Mogul-Bower Bearings, Inc., 4-page bulletin. Low oxide copper-alloy powders and their applications are described and illustrated.

Metal Powders Specifications: 223

Charles Hardy, Inc., 21-page data book. A reference book on powdered metals includes specifications of powders of all types, both elements and alloys. Given are compositions, physical properties, screen analyses, and other useful information.

Powder Metal Presses: 222

Haller, Inc., three single-page bulletins. Complete information and technical data are given on two mechanical presses for powder metals—Model 2000-A and Model 1010. Tools for making standard test specimens and a production and laboratory testing machine for powdered metal parts and die castings are also described.

Tablet, Compacting Presses: 227

Kux Machine Co., two illustrated bulletins. A series of newly-designed automatic tablet presses is described and illustrated. Specifications are included. Information is also available on a line of all-new hydraulic powder compacting presses, with capacities ranging from 50 tons to 500 tons. Complete specifications are charted.

Industrial Furnaces: 228

Lindberg Engineering Co., three bulletins plus data sheets. Bulletin No. 250 briefly describes the company's complete line of industrial heating equipment for both laboratory and production use. Bulletin No. 230 describes furnaces and atmospheres for sintering powdered metal products. Bulletin No. 241 describes the company's carbonitriding furnaces and their applications. Also available is a laboratory report giving tables of sintering temperatures and times, and the relative costs and uses of sintering atmospheres.

Hydraulic Presses: 229

Mannesmann-Meer Engineering & Construction Co., two data sheets. Special hydraulic presses for molding metal powders, ferrites, and ceramics are described and illustrated. The presses are available in three sizes, 60, 100, and 200 tons.

continued on page 105

Your Best Bet and at a low, low price, too!

Dillon UNIVERSAL TESTER

Designed for top accuracy at low cost, the DILLON Universal Tester is your wisest investment. Operates in tensile, compression, transverse or shear. Checks metal, plastics, wire, rubber, springs, etc. 7 interchangeable gauges. For materials up to 125,000 lbs. PSI tensile. Hand wheel operation or motorized. Equipped with max. indicator. Meets most all ASTM & Fed. specs. Handles round, flat or special shapes.

For low strength materials between 0 & 300 lbs. Model M (not shown) is available. Accurate to ½ of 1%. Has 5 scales.

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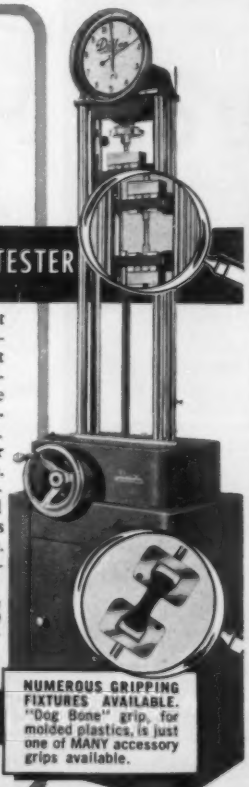

NUMEROUS GRIPPING FIXTURES AVAILABLE. "Dog Bone" grip, for molded plastics, is just one of MANY accessory grips available.

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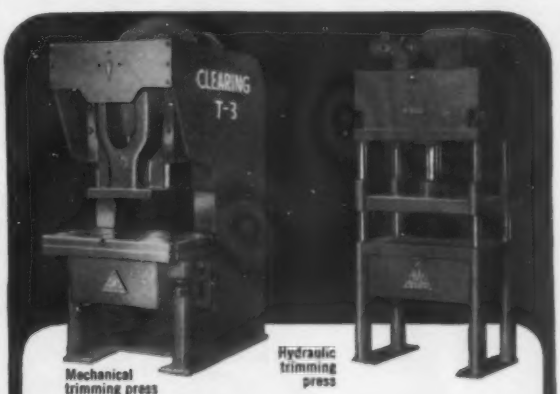

Trimming Presses Mechanical and Hydraulic

If you have been using stamping presses for trimming operations on die castings, you'll welcome Clearing's new standard line of trimming presses. Featuring large bed and slide areas, these low cost presses give the user a fine machine specially designed for trimming operations. Available in either mechanical gap-type, or hydraulic column type.

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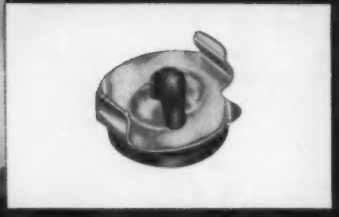
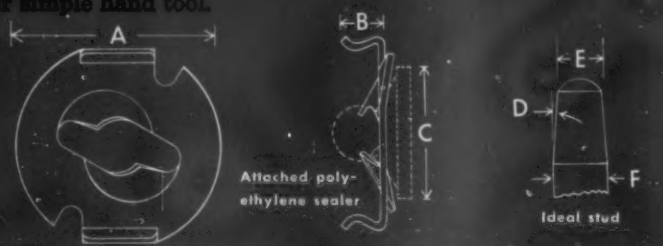
- Self-Locking
- Vibration-Proof
- Spring Take-Up

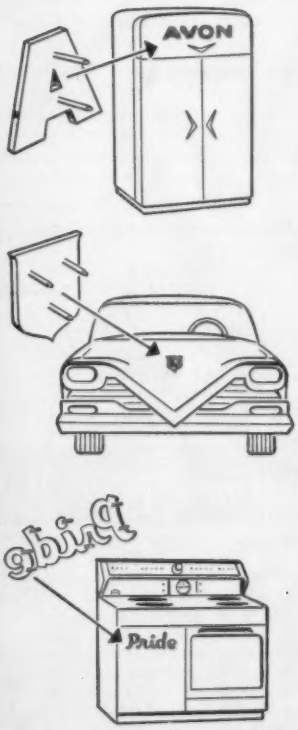


Specially designed to hold die-cast or cold-forged name plates, emblems and trim against sheet metal surfaces . . . DOT'S unique T.C.F. can be used in many other applications which require a spring take-up fastener that pulls up tight without backup on flat or contoured surfaces.

It cuts clean, deep threads on unthreaded studs, even those that are chrome plated. When used with its preassembled plastic sealer, T.C.F. makes a water-tight seal. The sealer *precedes* the fastener onto the stud so that it is not damaged by the thread-cutting process.

Available *in quantity*, with or without sealer, to fit 1/8" and 3/16" studs. Drawings available on request for magnetic tool or simple hand tool.





Nominal Sizes	A	B	C	D	E	F	Driving Torque	Ultimate Strength
1/8"	.560	.170	.450	6°/4°	.095 .085	.130 .125	7-10 Inch lbs.	200 lbs.
3/16"	.705	.200	.450	6°/3°	.160 .150	.192 .184	20 - 30 Inch lbs.	400 lbs.

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DOT T.C.F.
Patent Pending

Manufactured by
CARR FASTENER CO. DIVISION
Cambridge, Mass.

UNITED - CARR FASTENER CORPORATION

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FOUNDRY SUPPLY FIRMS MAY MERGE SOON

Archer-Daniels-Midland Company, Minneapolis, is negotiating for acquisition of The Federal Foundry Supply Company, Cleveland, Ohio, the two companies announced today.

Warner B. Bishop Jr., vice president of ADM's foundry products division, and Elmer Ditty, president of Federal Foundry, said it will be several weeks before a final decision is reached.

Acquisition of the Cleveland concern would further diversify ADM's operations in the three-billion-dollar-a-year foundry industry. The Minneapolis company now is one of the leading manufacturers of foundry core oils.

Federal Foundry's and ADM's product lines supplement each other, Bishop pointed out. The Cleveland firm produces "Seacoal" powdered coal, core washes, core facings, parting compounds, core blowing machines, bentonite and vermiculite. ADM does not presently produce or sell any of these items.

Bentonite, which Federal Foundry mines at Colony and Upton, Wyoming, is used in foundry sands. It also has various applications in the refining and taconite industries as well as other industrial uses.

Bishop said that if the transaction is completed, it is ADM's plan to continue operations of all departments of the Federal Foundry business without change or interruption afterward.

CHIEF METALLURGIST NAMED AT ILLINOIS PRECISE CASTING

Harold Zahalka has been appointed chief metallurgist at Illinois Precise Casting Co. of Chicago, Ill.

He had previously been employed by Casting Engineers and Thompson Products.

MORSE TO SPEAK AT N.Y.U. VACUUM METALLURGY COURSE

Richard S. Morse, president of National Research Corporation, will give the keynote address at the one week course in vacuum metallurgy being given at New York University by the Department of Metallurgical Engineering on June 10-14, 1957.

The course is given in recognition of the growing significance of vacuum metallurgy in research and industry as a means of protecting metals from the damaging effects of atmospheric gases. Most of the "new" metals such as titanium, zirconium, molybdenum and niobium can be successfully melted, cast or heat treated only under high vacuum. Many of the older metals like steel can be improved in physical, chemical and electrical properties by the use of vacuum processes.

The rapid accumulation of basic and applied information in vacuum metallurgy will be presented in 26 lectures by experts in the field over the five-day period.

National Research Corporation lecturers include H. A. Steinherz, who will speak on "Vacuum Pumping Systems"; J. L. Ham, speaking on "Skull and Permanent Electrode Melting"; P. J. Clough on "Vacuum Coating Processes"; and F. C. Benner on "Analysis Techniques". J. H. Durant will serve as moderator in the first day's meeting.

ELECTED DIRECTOR OF NEW JERSEY ZINC

Robert G. Page, president of Phelps Dodge Corporation, was elected a director of The New Jersey Zinc Company on April 18, 1957.

Model 20 New Holland

KREIDER

Centrifugal Dryer

AIR-DRIES...as it SPIN-DRIES!

Now you can *spin-dry* small parts in continuous *fresh air* in as little as 15 seconds . . . cut drying time *just about one-half.*

Double-action drying gives you smooth moisture-free surfaces . . . reduces your finishing problems by eliminating the scarring and marring frequently responsible for costly "rejects."

Speed production . . . cut costs way down with New Holland's easy-to-run Model 20 Kreider Centrifugal Dryer.

Choose from 3 models engineered to meet your requirements: — Standard Model; Standard Model with Supplementary Electric Heat; Standard Model with Supplementary Steam Heat.

— SPECIFICATIONS: —

1 h.p. motor—220, 440, 550 volts—2- or 3-phase—spins 75 lb. loads at 825 r.p.m. . . . Quiet V-belt drive . . . 30-blade suction turbine draws air through spinner . . . Arc-welded steel-plate construction . . . Heavy-gauge woven steel mesh basket . . . Weight: 490 lbs. . . . Floor space: Just under 5 sq. ft. . . . Meets N.F.C. Specs. **Optional:** J.I.C. Control: Mounted on right, left side or wall. 160° supplementary heat: 2350-watt Chromalox, or steam.

Send for illustrated 4-page folder. Address Dept. PM-657 New Holland Machine Company New Holland, Pa.

New Holland Machine Company

For more information circle No. 101 on the Reader Service Card

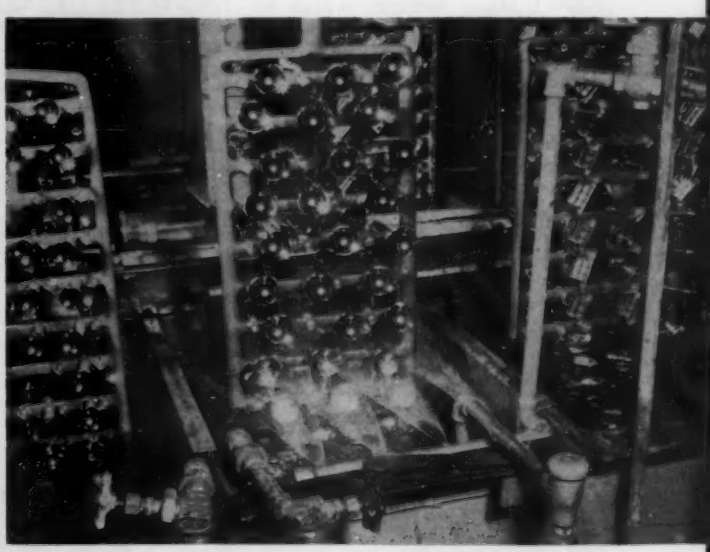
Finishing Of Ornamental

FROM ingot metal to finished cabinet hardware is the manufacturing story at Washington Steel Products, Inc. Zinc alloy is the metal and die casting the manufacturing process. Because these products must sell in a most highly competetive market, every possible manufacturing economy must be used. Initial design therefore assumes production by die casting and finishing by fully automatic methods. This combination assures a high quality product and the maximum economy in manufacturing.

Illustrations courtesy of Federated Metals Div., American Smelting and Refining Co.

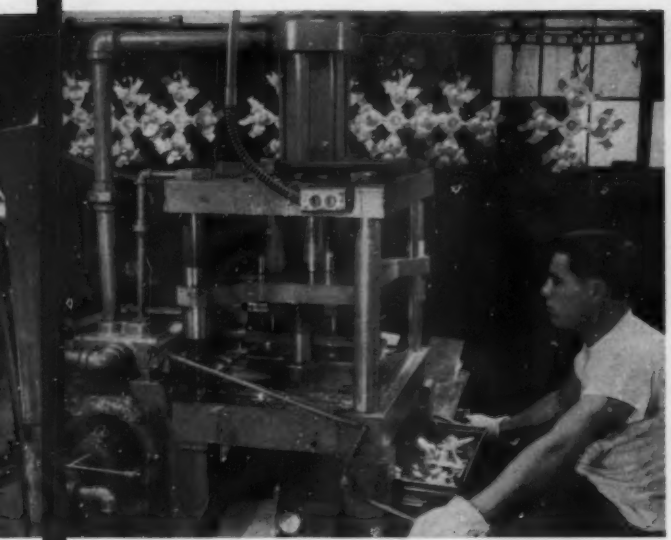
1. FOUR knobs are die cast simultaneously. After visual inspection at the casting machine, the gate of castings is placed on a conveyor for delivery to the trimming press.

4. POLISHING must be done on both sides of the knob. Using an Acme automatic polishing machine the entire job is done with only loading and unloading by hand being required.



5. PLATING to secure the desired finish is almost entirely automatic. Up to 72 knobs are racked and then put through the cleaning and plating cycle. Total time for the entire operation, about 90 minutes.

Die Cast Parts



2. TRIMMING is done on an hydraulic press. Here the knobs are removed from the gate of castings and all flash removed. This operation is critical. The recovery of usable knobs may depend upon its accuracy.

3. LIGHT MACHINING on the knobs includes drilling, tapping, deburring and turning down the rough edge. A six position, automatically indexing table is used on this fully automatic machine.

6. INSPECTION is one of the most critical steps. Because of their particular contour and exposed position, any defect is immediately apparent. Even minute blemishes are cause for rejection.

7. FINAL PACKAGING in individual plastic packages preserves the fine finish and provides 100 percent visibility. The completed knob is now ready for delivery to the individual purchasers.

(Advertisement)

SPECIAL REPORTS ON FINISHING NON-FERROUS METALS

NUMBER III—Lustrous, Corrosion-Resistant Finishing with Chemical Polishing Iridite

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

Chromate conversion coatings are widely accepted throughout industry as an economical means of providing corrosion protection, a good base for paint and decorative finishes for non-ferrous metals. Certain of these coatings also possess chemical polishing abilities that have luster-producing, as well as corrosion-inhibiting, effects on zinc and cadmium plate, zinc die castings and copper alloys. However, continued developments in this field have been so rapid that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this discussion of the many ways in which this chemical polishing characteristic can be used in final finishing or pre-plating treatments to produce a lustrous appearance with distinct display and sales appeal and appreciable savings in cost. Report I on decorative, corrosion-resistant finishes and Report II on paint base corrosion-resistant finishes are available on request.

The degree of luster possible on a surface is a function of the degree to which the surface can be smoothed. Leveling to provide a smooth surface can be achieved by mechanical or chemical means, or a combination of these, depending upon the luster desired and the original condition of the metal. Chemical polishing effectively imparts luster otherwise difficult and costly to obtain. For this reason, it is often used to supplement or entirely replace mechanical polishing, depending upon the application and the original condition of the metal. Chemical polishing has the additional advantage of providing overall treatment of the submerged part. It reaches into even the deepest corners and recesses that are otherwise inaccessible. Certain of the Iridites are specifically designed to perform this chemical polishing operation. Also, they provide corrosion protection as do all Iridites, thus may be used as a final finish or a pre-plating polish.

If Iridite is to be used as a final finish, in contrast to pre-plating treatment, the chromate conversion coating generated is allowed to remain, providing good corrosion resistance. Color inherent in these Iridite films ranges from a yellow cast to yellow iridescent. These coatings may be used without further treatment where this color is acceptable and good corrosion resistance is desired. Further, these basic coatings can be tinted by dyeing. Among the dye tints available are shades of red, yellow, blue and green. If desirable, the basic coatings can also be modified by a bleach dip leaving a clear bright or blue iridescent finish. In all cases bleaching reduces corrosion resistance.

As examples of this type of final finishing, Iridites #4-73 and #4-75 (Cast-Zinc-Brite) make possible for the first time, lustrous chemical polishing of the as-cast surface of zinc die castings. Thus, in many cases, sizeable savings in finishing cost are realized by elimination of plating costs. This economical method can be used on tools, appliance parts, toy pistols, locks and many other small castings. Another example is the treatment of copper and brass parts, such as welding tips, to eliminate buffing and provide additional corrosion resistance. In many cases, handling costs are reduced appreciably by replacing piece-part handling with bulk processing. Still another example of the use of this chemical polishing and protective quality of Iridite is a simple system of zinc plate, Iridite and clear lacquer instead of more costly electroplated finishes. Typical of this type of lustrous finish are builders hardware and wire goods.

As a pre-plating treatment, in contrast to final finishes, Iridite can be used to chemically polish zinc die castings or copper prior to plating. In such cases, Iridite should be applied as an in-process step, so that the protective film is removed before the plating cycle. The savings in handling, material and labor costs are obvious. This process has made it practical to plate chrome directly over copper on steel, conserving nickel, yet producing a lustrous chrome finish. Used after stripping faulty plate in reprocessing zinc die castings, Iridite restores luster to the casting, thus making possible replating without blistering.

Other Iridite finishes are available to produce maximum corrosion resistance, a wide variety of decorative finishes and excellent bases for paint on all commercial forms of the more commonly used non-ferrous metals. As a final finish, appearance ranges from clear bright to olive drab and brown and many films can be bleached or dyed. As a paint base Iridite provides excellent initial and retentive paint adhesion and a self-healing property which protects bare metal if exposed by scratching. Iridites have low electrical resistance. Some can be soldered and welded. The Iridite film itself does not affect the dimensional stability of close tolerance parts.

Iridites are widely approved under both Armed Services and industrial specifications because of their top performance, low cost and savings of materials and equipment.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product demands the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 East Monument Street, Baltimore 5, Maryland.

For more information circle No. 91 on the Reader Service Card

FIBER METALLURGY DESCRIBED

A new porous metal sheet material for wide usage in aeronautical and other fields was described by two scientists who worked on its development.

The material is a continuous sintered sheet of felted metal fibers which can be varied over a wide range of porosities having high strength-to-porosity ratios.

It was derived from a new technique called "Fiber Metallurgy," developed by metallurgical researchers at Armour Research Foundation of the Illinois Institute of Technology.

Work leading to practical industrial production of the material by the SOS company of Chicago was described at the Metal Powder Association's 13th annual meeting by Cord H. Sump, supervisor of powder metallurgy at Armour Research Foundation, and William Pollack, ARF associate metallurgist.

The two scientists reported that uses of the new product might include high temperature filters for aircraft engines, a honeycomb structure to fill tail and rudder sections, a porous material for transpiration cooling systems, and aircraft "boundry layer" control.

DIK NEW VICE PRESIDENT OF ABBOTT BALL

Edward S. Dik, associated with The Abbott Ball Company since 1954 as general manager, was named vice president at the annual directors' meeting, it is announced by Wade P. Abbott, president of the company.

Mr. Dik will continue to act as general manager for the firm which manufactures carbon steel bearing balls, barrel finishing materials and tumbling barrels. Prior to joining Abbott, he was associated with The Hartford Steel Ball Company and The American Optical Company.

NOLF NEW PLANT MANAGER WAGNER BROTHERS, INC.

W. R. Nolf, for the past three years plant superintendent of the Nuclear Products Div., American Car & Foundry Co., Buffalo, has been appointed plant manager for the Dix Ave. plant of Wagner Bros. Inc., Joseph R. Wagner, president, announced recently.

In his new capacity, Nolf will be responsible for the operation of the company's Dix Ave. facilities, including all phases of manufacturing plating machines, rectifiers, and related metal plating equipment, under the direction of O. H. Tiedeman, plant general manager.

PREALLOYED STEEL POWDER PRICE CUT

Price reductions, averaging 20%, on prealloyed steel powders used for powder metallurgy applications were announced by Vanadium-Alloys Steel Company, Latrobe, Pa.

Improved manufacturing techniques made the powder price reductions possible. These new techniques are a by-product of a development program aimed at providing the powder metal industry with specialty alloy powders offering improved molding and sintering qualities.

The Vanadium-Alloys Steel Company, long a producer of high speed tool and alloy steels, first began manufacturing prealloyed steel powders after the Second World War using a special patented process which atomizes molten metal of the desired analysis. This results in powder particles that are actually identical in chemical analysis to the original melt.

The aircraft, petroleum and chemical industries consume large quantities of prealloyed steel powders for use in heavy duty filters requiring controlled porosity and super corrosion resistance. Stainless steels, low alloy structural steels and high tem-

Continued on page 71

Announcing...

A big step forward in barrel finishing

Improved ALUNDUM TUMBLEX* "A" abrasive brings you many new "Touch of Gold" advantages*

The new Norton TUMBLEX "A" abrasive has exceptionally long life . . . great resistance to wedging in work-piece crevices . . . adds attractive lustre . . . and can handle the widest variety of parts.

It performs several operations at once — removing flash, scale, tool marks and burrs, while forming radii and finishes to the required microinch. It is also better sized, more uniform in shape and available in a wider range of sizes.

Send Your Work Samples to our enlarged Sample Processing Department — and include a finished piece. We will barrel finish the samples with new TUMBLEX "A" abrasive — or any Norton tumbling abrasive that may be more suitable — and explain how you can improve finishing operations. NORTON COMPANY, *General Offices,* Worcester 6, Mass. Plants and distributors around the world.

G-311

SIZES NOW AVAILABLE

No.	Size	No.	Size
00	1½" to 2"	3½	5/16" to 3/8"
0	1" to 1½"	4	7/32" to 5/16"
1	3/8" to 1½"	5	3/16" to 1/4"
1½	1 1/16" to 3/8"	6	1/8" to 5/16"
2	9/16" to 3/4"	8	3/32" to 1/8"
2½	1/2" to 9/16"	10	standard 10 mesh
3	3/8" to 1/2"	12	standard 12 mesh

Every one of these sizes has advantages that will increase product value and cut the costs of general barrel finishing. That's how the improved TUMBLEX "A" *abrasive will step up your profit-boosting "Touch of Gold" to a new high.*

NORTON ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels Grinding Machines • Refractories

BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones Behr-cut Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

For more information circle No. 102 on the Reader Service Card

AT CANADIAN PRATT AND WHITNEY AIRCRAFT...

ALMCO barrel finishing SAVES 97% on deburring and finishing of spark plug bushings

CUTS DEBURRING AND FINISHING COSTS $2,430 — Threaded spark plug bushings used in famous Pratt & Whitney aircraft engines will be deburred and finished for $2,430 less this year with Almco equipment and processes. Maurice Harrison, Supervisor of Process Planning, shows the small part on which this savings will be made.

● SAVES .10125 ON EACH BUSHING—Deburring and finishing threaded spark plug bushings like the one shown at the left, formerly cost $104.20 per thousand when CP & W used speed lathes, portable power tools and other hand methods.

After installing two ALMCO DB-200 Supersheen units, records showed a cost cut of 97%. This equipment turns out 1,000 bushings in 45 minutes, releases grinders and finishers to other duties. Cost reports showed:

$104.20	cost per thousand with power tools.
2.95	cost per thousand with 2 ALMCO barrels.
$101.25	Savings per thousand pieces.

This year CP & W will process 24,000 spark plug bushings, *with a total savings of $2,430 on this one part alone.*

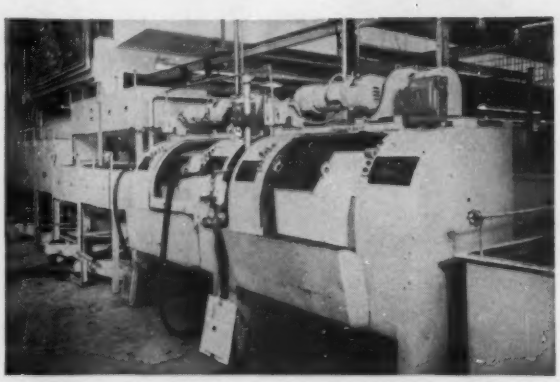
PRACTICALLY ELIMINATES REJECTS—Before installing controlled-type barrel finishing, parts inspectors returned for re-work an average of 125 bushings out of every 1,000 (12½%). With Almco Supersheen equipment and processes, these parts are now finished to a degree of uniformity that is virtually free of rejects.

DESIGNED FOR MANY METAL FINISHING OPERATIONS—In addition to deburring and finishing, ALMCO equipment and processes are used for descaling, degreasing, grinding, burnishing, work-hardening, rust-inhibiting, polishing, etc.

ALMCO has facilities throughout the United States for running sample parts. Write us on your letterhead for the address of an Almco sample processing laboratory or branch office in your area. Your sample, with your specifications, will be handled promptly. You'll get a complete report on where you can save deburring and finishing costs, how you can improve product quality and appearance, and what method and unit is best for your operation. Or, if you prefer, ask an Almco sales engineer to call you.

SEND FOR FREE 52-PAGE BOOK

Full of facts and processes on barrel finishing. Includes detailed cost chart on finishing of typical parts. Send for your copy today.



Two Model DB-200 Almco machines, using Supersheen bonded abrasive chips and compounds, deburr and polish 1,000 spark plug bushings in 45 minutes at Canadian Pratt and Whitney.

ALMCO

DIVISION OF QUEEN STOVE WORKS, INC.

76 Marshall Street • Albert Lea, Minnesota

Sales and Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven, Philadelphia and London, England

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ALL DIE CASTING PROBLEMS CAN BE SOLVED —

THE Authenticast WAY

• DIE CASTING

ALL LEAD BASE ALLOYS

COMPLETE ASSEMBLED PRODUCT OR ANY SPECIFIC PART!

Send Blueprints or Specifications-

ESTIMATES GIVEN WITHOUT OBLIGATION

COMET METAL PRODUCTS CO., INC
91-07 132nd St. Richmond Hill, N. Y.

perature alloy steel powders are used for a wide variety of structural applications, such as water meter parts, self-oiling bushings, cams, latches, gears, dogs and other components requiring high strength and complex shapes.

In addition to prealloyed stainless steel powders, special alloys are produced including brazing compositions, high temperature alloys, super corrosion resistant grades, electrical and magnetic alloys. Many of these special compositions are produced to exact customer specifications. It is believed lower prices will encourage consumption of powders.

RECENT U. S. LICENSEES IN THE SHAW PROCESS

The Shaw Process Development Corp., Port Washington, N. Y., has announced the licensing of three of the country's outstanding producers of plastic molds diecasting dies and forging dies: Mojave Die & Engraving, Los Angeles, California; Osley-Whitney, Inc., Westfield, Massachusetts; Permadent Laboratories, New York, N.Y., to produce cavities and cores by the Shaw Process of precision investment casting.

NEW

Luster-on®

52 POWDER

PROTECTS and BRIGHTENS ZINC at LOWEST COST YET

LUSTER-ON 52 POWDER *is a low, low priced single dip, no-leach conversion coating for zinc plated surfaces.*

LUSTER-ON 52 POWDER was recently developed by The Chemical Corporation for automatic equipment where facilities are not available for added leaching and rinsing.

LUSTER-ON 52 POWDER gives a bright bluish hue; provides lasting corrosion protection against staining, tarnishing and white powder products.

LUSTER-ON 52 POWDER can *now* be used in cases where cost has prohibited use of chromates in the past. For instance, electrical conduit, conduit boxes, screws and builder's hardware, tools, electronic parts, air conditioning parts, automotive parts, cheap toys.

LUSTER-ON 52 POWDER is not only low, low in price, but eliminates expensive handling, space-consuming storage and carboy deposits.

Still available, of course — time-tested Luster-On liquid dips and coatings for all your needs.

Data Sheets and Prices on Request. Send in part for free processing.

West Coast: Crown Chem. & Engr. Los Angeles & San Francisco

Canadian Licensee: Alloycraft Ltd. Montreal

THE Chemical CORPORATION

66 Waltham Ave. • Springfield 9, Mass.

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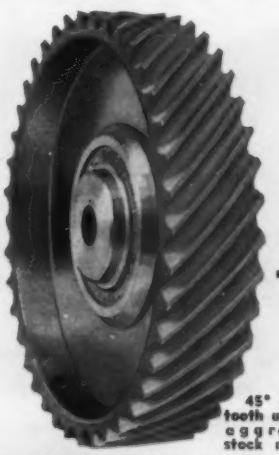
A BETTER BACK-UP WHEEL

R57

FOR YOUR ABRASIVE BELTS



45° scoop tooth used for aggressive stock removal

NOW IN POPULAR 14" DIAMETER SIZES AT BIG SAVINGS

Now—new production techniques allow you to SAVE on new R-57 Rubber Contact Wheels! They have all the well-known features of R50 and R54 models — longer belt life, oil resistant rubber, wet or dry use, heat dissipation, maximum safety, etc. And what's more, they have a 30% trade-in value! (The R57, R50 and R54 wheels come in many popular sizes, ½" to 22" diameters in 1" to 6" widths, or to your specifications.)

14"

WIDTH OF FACE				
TYPE	1"	2"	3"	4"
14" PLAIN	32.00	34.00	36.00	38.00
SERRATED	37.00	39.00	42.00	44.00

IN PLAIN OR SERRATED FACE IN ALL DUROMETERS

DElta 6-8900

A WHEEL FOR EVERY OPERATION

45° Standard Stock Removal

Slit Serration Aggressive Contact Work

"X" Serration Moderate Contour Work

Cosmo Expander Operates Without Backstand Idler

CHICAGO RUBBER COMPANY, INC.

651 MARKET STREET • WAUKEGAN, ILLINOIS

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ALLOYS AND CASTINGS FOR A COMPETITIVE EDGE

FREE . . . send for your copy of the helpful new Westinghouse booklet, *For a Competitive Edge* (B-6570). It describes how you can keep up with metals advances in the face of increasing investment and rapidly expanding metals science.

The booklet takes you on a tour of the new Westinghouse metals plant at Blairsville, Pa. Pilot plant facilities here can help you explore full production conditions and create prototype quantities for wrought alloys and molded-metal products. Some production capacity can be made available for fast, dependable delivery of metal products.

Arrange to see the 16-mm, full-color, 22-minute Westinghouse film, *This New World of Metals*. Write Westinghouse Electric Corporation, Materials Manufacturing Department, Blairsville, Pennsylvania. J-05003

YOU CAN BE SURE...IF IT'S

Westinghouse

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DATA IN ADS—continued

48. **"Cast to Outlast"** — is the title of a 16-page booklet showing how to keep costs in line on small parts. Published by The International Nickel Co., Inc., it is illustrated.

49. **Special Casting Problem?** — A brochure and other data offered by Investment Casting Co. are published to help solve special casting problems by using one-piece investment castings.

50. **Induction Melting** — Complete details on "Inducto Melters" in a capacity range from 1 to 60 pounds for investment castings are available from Inductotherm Corp.

52. **Electric Furnaces** — Full information is available from Detroit Electric Furnace Div., Kuhlman Electric Co. on two new direct-casting electric furnaces for investment castings.

53. **Die Casting Machines** — An illustrated catalog from Kux Machine Co. describes their complete line of die casting machines which feature automatic operation at high speeds.

54. **Stainless Steel Castings** — Design File "F" published by Lebanon Steel Foundry tells how the company meets the most difficult tolerance, surface, and dimensional accuracy requirements in steel casting.

55. **Die Casting Machines** — Bulletin No. 101 from Lester-Phoenix, Inc. gives specifications and complete descriptions of their line of die casting machines.

57. **Aluminum, Magnesium** — die castings, their production and advantages, are discussed in literature and design information available from Litemetal Dicast, Inc.

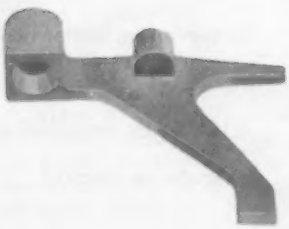
61. **Standard Bearings** — National Molded Products, Inc. has issued a listing of standard size bushings and bearings carried in stock. Sizes, load data, etc. are given.

64. **Hobbed Dies** — A booklet published by Newark Die Hobbing & Casting Co. entitled "How and When to Hob" discusses the advantages and proper applications of hobbing as a die sinking method.

66. **Vacuum Furnaces** — A bulletin from NRC Equipment Corp. describes vacuum furnaces for either pilot or full production of investment castings.

Continued on page 123

PMM



SECOND ANNUAL

INVESTMENT CASTING *Directory*

REFERENCE DATA, *useful facts for designers and buyers.*

DIRECTORY, *an alphabetical listing of manufacturers.*

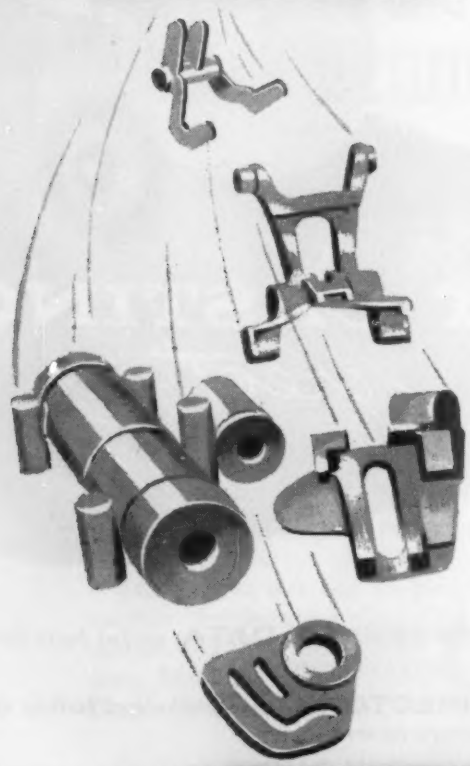
BUYERS' GUIDE, *listing by product classification.*

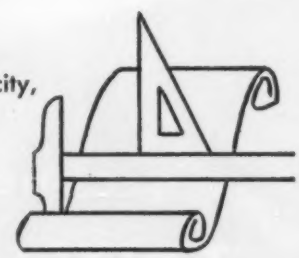
JELRUS has moved

to service *your* future needs in INVESTMENT CASTINGS

Your enthusiastic acceptance of JELRUS Investment Castings necessitated a departure from our previous quarters.

To serve you better now . . . to anticipate your increased requirements in the future . . . JELRUS has acquired a new home *three times as large as before!*





In addition to tripling our capacity, we will have new heat treating, x-ray, magnaflux and zyglo inspection facilties, modern as tomorrow's blueprint. This will assure you the continuation of productive facilities and quality control that have made JELRUS investment castings and service *second to none.*

JELRUS
cordially invites your inspection
of its new quarters
after July 1st

JELRUS
PRECISION CASTING CORP.
615 WEST 131st STREET
NEW YORK 27, N. Y.
AUdubon 6-2600

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TECHNICAL SECTION

Composition and Mechanical properties of . . .

The Commonly Investment-Cast Alloys

ANY listing of cast alloys with their mechanical and physical properties can be misleading. While the composition will be reasonably constant and normally should fall within the limits given, it should be recognized that variations in melting practice that may be required for unusually difficult parts can result in compositional variations.

For some parts that are difficult to fill, it may be necessary to vary the composition to secure greater fluidity, for example, thus resulting in a departure from chemical specifications. This same departure may result when sudden changes in section occur to prevent hot tears and/or porosity.

Before a casting is rejected on the basis of small variations in composition, the vendor should be consulted to determine whether or not these variations can be avoided.

Can Variations Be Avoided?

In some cases they can be either avoided or minimized by altering the composition of the melting stock. In other cases, however, it may be impossible to prevent departures from specification, but in nearly every case these departures are of such minor nature that the functional requirements will not be impared at all.

This same judgment must be used in the stringent application of published physical and mechanical properties. The properties given in the following tables have been determined on cast test bars. Naturally, every effort is made to have the bars representative of the castings as possible but they do not, of necessity, represent the mechanical properties of the casting nor the properties of a test bar cut from the casting.

Where mechanical properties are used for acceptance it is not uncommon to cast the test bars at the time the castings are poured, with one or more bars in each flask of parts. When cast in this manner, or when cast separately, but from the same melt of metal the properties determined must be correlated with life testing, proof testing or some other criteria that is acceptable to both the purchaser and to the vendor.

In some cases it may be found that even though the test bars and the composition fall within specifications; performance tests on the parts show failures due, presumably, to lower than specified mechanical properties. Under these conditions, that trouble is generally faulty design. Faulty, that is, from the foundryman's point of view. A section which stress analysis has shown to be adequately strong may fail because it is impossible to achieve even near maximum mechanical properties because of founding difficulties. When such a condition arises the best solution is consulation with a responsible vendor of investment castings.

Problems Are Familiar

Because of the wide variety of parts that a jobbing foundry must make, there are few problems that have not come up before and for which a solution has not been found. The purchaser should always remember that in buying investment castings, he is not only buying a few ounces or pounds of shaped metal — he is also buying the know-how and experience of the foundryman.

If this experience and knowledge is used, better castings and a more compatable relationship between buyer and seller will invariably result.

Many Alloys Listed

A number of the alloys listed in the accompanying tables are covered by Investment Casting Institute Standards. Whenever possible the ICI standard number should be used as these are accepted by the entire investment casting industry in the United States. Standards thus far issued are: Al-1, heat treatable aluminum alloys silicon-magnesium and silicon-copper aluminum base alloys; Co-1, corrosion and heat resistant cobalt base alloys, chrominum, nickel, molybdenum and chromium, nickel, tungsten types; Cu-1, silicon brass; Fe-1, carbon steels, low carbon and medium carbon; Fe-2, low alloy steels, chromium molybdenum and nickel chormium molybdenum types. The alloys covered by the ICI specifications are indicated on the tables.

The editors wish to express their thanks to Austenal, Inc. and Precision Metalsmiths, Inc. for furnishing data used in these tables.

Alloys Commonly Cast As Investment Castings

I. Ferrous Base Alloys

	Composition									Mechanical Properties									
										As Cast or Annealed					As Hardened				
Stainless	C	Si	Mn	S	P	Cr	Ni	Mo	Other	Tensile psi	Yield psi	Elongation %	Red. of Area %	Hardness	Tensile psi	Yield psi	Elongation %	Red. of Area %	Hardness
Type 302	.08 .15	1.0 Max	1.5 Max	.03 Max	.04 Max	17.0 Max	7.0 Max	0.5 Max	0.5 Cu Max	80,000	40,000	45	60	84-86 RB					
303	.20 Max	2.0 Max	1.5 Max	0.2 0.4	.05 Max	18.0 21.0	9.0 12.0	.40 .80		75,000	30,000	35	35	80 RB					
310	.15 Max	.50 1.50	2.0 Max	.03 Max	.04 Max	25.0 26.0	19.0 22.0	.50 Max	0.5 Cu Max	60,000	25,000	40	60	70 RB					
316	.15 Max	.75 Max	1.5 Max	.03 Max	.04 Max	16.0 18.0	12.0 14.0	1.50 2.25	.5 Cu Max	81,000	34,800	48	55	73-75 RB					
347	.12 Max	1.0 Max	2.0 Max	.03 Max	.04 Max	18.0 19.5	10.0 14.0	.50 Max	Cb & Ta 10 x C Min 1.5 Max	77,500	40,500	44		73-75 RB					
Armco 17-4 PH AMS-5355	.07 Max	1.0 Max	1.0 Max	.03 Max	.04 Max	15.5 17.5	3.0 5.0		3.0 - 5.0 Cu	167,000	87,000	1.0	2.0	38-41 RC	180,000	115,000	3.0	5.0	40-45 RC
410	.15 Max	1.0 Max	1.0 Max	.03 Max	.04 Max	11.5 13.0	.50 Max	.50 Max	.50 Cu Max	156,000	143,000	3.5		32-38 RC	204,000	128,000	6.0	10.0	40-44 RC
420	.20 .40	1.5 Max	1.0 Max	.03 Max	.04 Max	11.5 14.0	1.0 Max	.50 Max	.50 Cu Max	100,000	76,000	4.0	1.5	27-30 RC	220,000	165,000	1.0		45-48 RC
431	.12 .20	1.0 Max	1.0 Max	.04 Max	.04 Max	15.0 17.0	1.5 3.0	.50 Max	.5 Cu Max	*120,000	90,000	15.0	20.0	26 RC	140,000 180,000	100,000 130,000	15 10	30 15	30 RC 42 RC
440-A	.60 .75	1.0 Max	1.0 Max	.03 Max	.04 Max	16.0 18.0		.75 Max		102,300	92,200	2.0	3.0	36-40 RC					58 RC
Carbon & Low Alloy																			
1020	.18 .23	.75 Max	.30 .60	.05 Max	.04 Max					*70,000	35,000	25	40	77 RB	125,000	100,000	15	40	30 RC
1035	.32 .38	.75 Max	.60 .90	.05 Max	.04 Max					*85,000	45,000	20	35	84 RB	150,000	130,000	5	15	38 RC
1095	.90 1.05	.75 Max	.30 .50	.05 Max	.04 Max					*125,000	65,000	5	5	25 RC					
4140	.35 .45	1.0 Max	.50 1.00	.03 Max	.04 Max	.80 1.10		.15 .25		132,200	117,200	4.5	7	28-32 RC	155,000	142,000	9.0	17.0	33-36 RC
4340	.38 .43	.75 Max	.60 .80	.04 Max	.04 Max	.70 .90	1.65 2.00	.20 .30		*100,000	60,000	20	45	93 RB	200,000	170,000	5	20	43 RC
4620	.15 .25	.75 Max	.75 Max	.03 Max	.04 Max		1.5 2.0	.20 .30		96,000	59,000	14	26	85-95 RB	130,000	110,000	15	25	26-30 RC
6150	.45 .55	1.0 Max	.50 1.0	.03 Max	.04 Max	.80 1.10			.15V Min	115,500	91,400	2.5	1.5	25-28 RC	225,000	200,000			62 RC
8620	.18 .23	.75 Max	.70 .90	.04 Max	.04 Max	.40 .60	.40 .70	.15 .25		*85,000	40,000	20	40	85 RB	110,000 150,000	90,000 120,000	20-10	50-30	22-33 RC
52100	.95 1.10	.75 Max	.60 Max	.03 Max	.04 Max	1.25 1.60				110,000	108,000	1.0		24-27 RC					63 RC
Tool Steels																			
Water Hardening	.45 .55	.80 1.20	.30 .60	.03 Max	.04 Max			.40 .60		100,000	68,000	18	23	20-22 RC					63 RC Max
Oil Hardening	.85 .95	.75 Max	1.2 1.5	.03 Max	.04 Max	.40 .60			.30 - .50 W	145,000	118,000	1.0	1.0	39-42 RC					63 RC Max
Air Hardening	1.4 1.6	.75 Max	1.0 Max	.03 Max	.04 Max	10.0 12.0		.70 .90	.10 - .25 V	107,000	86,000	1.5	2.0	35-38 RC					63 RC Max
High-Speed	.65 85	.75 Max	.75 Max	.03 Max	.04 Max	3.5 4.5		.60 .80	1.0 - 1.25 V 17 - 19 W 4.0 - 6.0 Co					45-55 RC					66 RC Max

Continued on page 78

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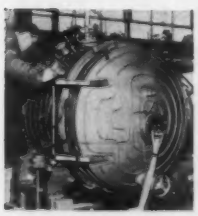

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	Composition									Mechanical Properties									
										As Cast					Hardened				
Nickel Base																			
	C	Si	Mn	S	P	Cr	Fe	Mo	Others	Tensile psi	Yield psi	Elongation %	Red. of Area %	Hardness	Tensile psi	Yield psi	Elongation %	Red. of Area %	Hardness
S-Monel	.30 Max	3.5 5.0	.50 1.5	.03 Max	.04 Max		3.5 Max		62 - 68 Ni Bal Cu	134,000	121,000	6.0	6.0	33-38 RC	140,000	126,000	2		42 RC Max
Monel	.30 Max	1.0 2.0	.5 1.5	.03 Max	.04 Max		2.5 Max		62 - 68 Ni Bal Cu	65,000	32,500	25.0		76 RB					
Beryllium Nickel	0.4 Max					.80 Max			2.55 - 2.80 Be Bal Ni	115,000	60,000	7.0	5.0	24-30 RC	200,000	190,000	0-2	0-1	52-56 RC
High Temp. Alloys																			
Alloys	C	Si	Mn	Co	W	Cr	Ni	Mo	Others										
AMS 5388B	.15 Max	1.0 Max	1.0 Max	2.5 Max	3.75 5.25	15.5 17.5	Bal	16.0 18.0	4.5 - 7.0 Fe .2 - .6 V	80,000	50,000	5	5	20 RC					
AMS 5382B	.45 .55	1.0 Max	1.0 Max	Bal	7.0 8.0	24.5 26.5	9.5 11.5		2.0 Fe Max	110,000	80,000	8	10	30 RC	125,000	110,000	2	3	
AMS 5376B	.20 Max	1.0 Max	1.0 2.0	18.5 21.0	2.0 3.0	20 22	19 21	2.5 3.5	.75 - 1.25 Cb & Ta Bal Fe	95.000	55,000	25	15	85 RB					
AMS 5385 C	.20 .30	1.0 Max	1.0 Max	Bal		25.0 29.0	1.75 3.75	5.0 6.0	3.0 Fe Max	100,000	80,000	8	10	28 RC	120,000	100,000	2	3	
309 (Mod.)	.15 .30	.75 2.00	1.0 Max		2.5 3.5	22.0 25.0	11.0 14.0		Bal Fe	80,000	40,000	15	25	80 RB					
Inconel X	.08 Max	.50 Max	.3 1.0			14.0 16.0	70.0 Min		5.0 - 9.0 Fe .7 - 1.0 Cb 2.25 - 2.75 Ti .4 - 1.0 Al						105,000	85,000	4	6	29 RC
Waspaloy (1)	.10 Max	.75 Max	.50 Max	12.0 15.0		18.0 21.0	Bal	3.5 5.0	2.0 Fe Max 1.0 - 1.5 Al 2.75 - 3.25 Ti						115,000	90,000	6	7	30 RC
Udimet 500 (1)	.15 Max	.75 Max	.75 Max	13.0 20.0		16.0 20.0	Bal	3.0 5.0	4.0 Fe Max 2.5 - 3.2 Al 2.5 - 3.25 Ti						125,000	100,000	5	6	35 RC

II. Non Ferrous Base Alloys

Copper Base	Composition											As Cast				Heat Treated				
	Si	Mn	Cr	Ni	Cu	Mg	Al	Pb	Sn	Zn	Others	Tensile psi	Yield psi	Elongation %	Hardness	Tensile psi	Yield psi	Elongation %	Red. of Area %	Hardness
Beryllium Copper	.35 Max		.005 Max		Bal		.15 Max	.02 Max		.10 Max	.25 Fe Max .3 - .65 Co 2.5 - 3.0 Be	75,000	40,000	30	75-90 RB	175,000	155,000	1		40-44 RC
Silicon Brass	3.0 5.0				Bal			.5 Max		12.0 16.0		60,000	24,000	15	56-58 RB					
Navy Bronze ASTM-B-143-1B				1.0 Max	86.0 89.0			.3 Max		3.0 5.0	.15 Fe Max	40,000	18,000	20	48-51 RB					
Bronze AMS 4640		1.5 Max		4.5 5.5	78.0 Min		9.7 10.9		.20 Max	.30 Max	2.0 - 3.5 Fe	85,000	40,000	10	87-90 RB					
Aluminum Base																				
Type 356	6.5 7.5	.3 Max			.2 Max	.2 .4	Bal			.3 Max	.6 Max Fe .2 Max Ti	22,000	15,000	.7 Min		(2) 32,000	28,500	3.0	5.0	65 Min BHN
355	4.5 5.5	.5 Max			1.0 1.5	.4 .6	Bal			.3 Max	.8 Max Fe .2 Max Ti	22,000	15,000	.5 Min		(2) 33,000	29,000	2.5	4.0	70 Min BHN
40-E	.25 Max	.30 Max	.4 .6		.30 Max	.5 .7	Bal			5.0 6.0	1.0 Max Fe .1 - .3 Ti					(3) 32,000	22,000	3.0		65 Min BHN
Tern Alloy #7	.20 Max	.4 .6	.2 .4	.2 Max	.2 Max	1.8 2.4	Bal			4.0 4.5	.8 Max Fe .2 Max Ti	30,000	19,000	2.0	65 Min BHN	(2) 40,000	37,000	0.5		75-85 BHN

(2) T-6 Condition
(3) T-5 Condition

This alloy "shopping list" saves many a day for busy metallurgists!

AISI		AMS			SAE	
302	410	5333	5376	5631	30302	51442
303	414	5334	5378	5640	30303	51446
304	416	5350	5380	5643	30303F	60303A
308	420	5351	5382	5645	30304	60304
309	430	5352	5385	5665	30310	60310
309+W	430F	5354	5386	5700	30316	60316
310	431	5355	5388	5710	30321	60347
316	431A	5358	5389	5735	30347	60410
321	436	5360	5392	5765	51410	60420
327	440A	5361	5393	6270F	51414	60442
329	440B	5362	5394	6274F	51416F	60446
330	440C	5363	5526	6280C	51420	70310
331	440F	5366	5537	6350	51430	70310A
347	442	5369	5610E	6382	51431	70327
403	446	5370	5616	6428	51440A	70330
406		5372	5621	7834	51440B	70331
		5373	5628		51440C	70446
		5375	5630		51440F	

MISCELLANEOUS

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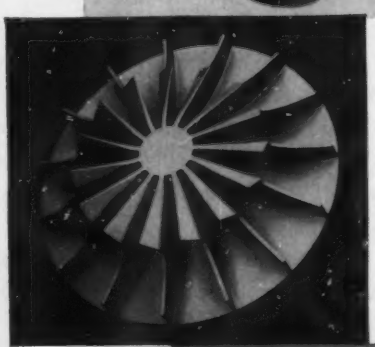

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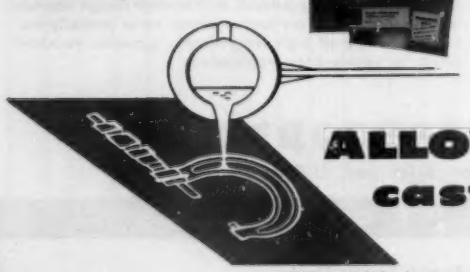

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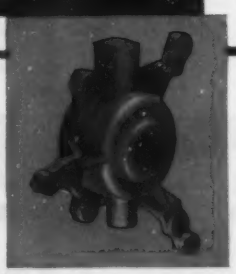

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Design Specifications For Investment Castings

THE following specifications are a summary of Investment Casting Institute's Engineering and Design Manual.* Since these specifications, as given below, are a highly condensed version, they should not be used in place of the complete Design Manual available from the ICI. Rather the thought in presenting them here is to show to the engineer what design considerations are being brought under specification control and to give the broad limits within which investment castings can be most economically made.

As the final Design Manual points out and as this and other publications have emphasized, DEPARTURES FROM INDUSTRY STANDARDS NEARLY ALWAYS LEAD TO INCREASED COSTS AND THE GREATER THE DEPARTURE THE HIGHER THE COSTS WILL RISE. It should be further pointed out that whenever any doubt exists in the mind of the designer a competent fabricator should be consulted before a design is finalized. By following the fabricator's advice costs can be kept down and, in many cases, an otherwise impossible casting can be made that is completely functional and economically acceptable. It is certain that by following recommended practices and specifications at the time of design, many hours and many headaches can be saved both the purchaser and the vendor.

SURFACE FINISH

Most non-ferrous metals can be cast with an as-cast surface value (RMS) of 60 to 100 microinches. Ferrous metals, with the exception of the 400 series of stainless steels, average 90 to 125 microinches (RMS). The 400 series of stainless steels will average 100 to 125 microinches (RMS).

DIMENSIONAL TOLERANCES

LINEAR—On dimensions under 1 inch a tolerance of ±0.005 should be allowed. On dimensions over 1 inch ±0.005 in./in. is desirable. These tolerances are for functional measurements, on non-functional dimensions ±1/64 should be allowed on dimensions under 2 in. This increases up to ± 1/16 on dimensions over 6 in.

RADII—For small radii a tolerance of ±1/64 should be allowed. This should be increased ± 1/64 for each 2 in. of radius.

STRAIGHTNESS—This is almost entirely a function of length. For bars under 2 in. length ±0.010 TIR should be allowed. This increases to ±0.030 TIR for bars above 6 in. in length.

FLATNESS—As in the case of straightness, length is the principal factor in flatness tolerances. Up to 1 in. lengths a total bow of ±0.008 is common and increases to ±0.030 on lengths greater than 6 in. Both straightness and flatness tolerances are for as-cast parts.

CONCENTRICITY—This tolerance is a function of both inside and outside diameters. General tolerances vary from a low of ±0.004 TIR on small diameters to ±0.010 for a 2 in. OD and 1 in. ID.

ROUNDNESS—In the as-cast condition, roundness is a function of diameter and varies from ±0.005 TIR for diameters under ½ in. up to ±0.015 TIR for a bar of 2 in. diameter. Slightly greater tolerances should be allowed on inside diameters.

LENGTH—In general an overall tolerance of ±0.005 in./in. is the minimum that should be required. However, casting shape, cored holes, etc. can so materially change this that the casting source should be consulted before setting this figure.

PARALLELISM—This factor is strictly a function of design and can not be set forth in detail. The vendor should be consulted before limits are set by the designer.

CORED HOLES—Tolerances for both blind and through cored holes are dependant upon both the design of the part and the skill of the foundry. While rough tolerances can be set, by far the safest policy is to consult the casting vendor. (Note: The ICI Design Manual will contain minimum and desirable tolerances for a wide variety of different shaped cored holes. The amount of detail required to properly elucidate this phase of design can not be given in this brief review).

THREADS—In general threads are more economically cut than cast. Where-ever possible neither ID nor OD threads should be specified to be cast.

*The complete "Investment Casting Engineering and Design Manual" is available from the Investment Casting Institute, 27 E. Monroe St., Chicago 3, Ill. Price $5.00 to non-members.

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"If this directory serves to develop cast parts that have never been Investment Cast before, it will have done its job; therefore . . ."

About This Directory

THE publication of a directory always involves a certain amount of risk. In spite of the care that is exercised, some errors always seem to creep in. A name will be misspelled, a listing omitted or an unauthorized listing printed. We have tried to keep these mistakes to a minimum. Should some errors occur we apologize in advance.

Where desired listings are omitted this is generally because the questionnaire, on which the directory is based, was not properly filled out by the individual in the company to which it was addressed. Before any listing can be inserted, we must have verification of it from the subject company. Even in those cases where the editors are certain that either more or different listings should be made, we may not do so without authorization.

Due to the rapid growth of the investment casting industry, it is practically impossible to keep a file of companies who make castings or companies who supply fabricator companies completely up to date. It is possible, therefore, that a very few foundries or supply houses may not be in this directory. If such omissions have occured we hope that the companies concerned will write us so that our files can be corrected prior to next year's directory.

Designers, production men and executives will find that among the foundries listed there are always several who can make any castable part they might want. These companies are both willing and able to help in all stages of production from original design to finished product. If wider use is made of their services, better castings at lower cost will invariably result. While investment casting is developing rapidly into as exact a science as any foundry procedure can, there still remains a considerable degree of "art" that is peculiar to each establishment.

One factor that is helping to remedy this situation is the existance and activity of the Investment Casting Institute. This organization is composed of investment casting foundries and supply companies associated with the industry. Through the efforts of this trade association a considerable degree of standardization is occurring in metals and testing procedures. The Institute has published quite recently an engineering and design manual that, if followed, will help to insure the best possible design at the lowest possible cost. Information on this manual can be secured from the Investment Casting Institute, 27 E. Monroe St., Chicago, Ill.

Research within the industry and new products that are constantly being developed for the industry are coming at such a rapid rate that a part which only a short time ago could not be cast may be possible now. Proposed uses of investment castings should not, therefore, be predicated upon information and experience gathered as little as a year ago. It is almost certain that among the companies listed in this directory there are those who today can do yesterday's impossible jobs. If, therefore, this directory serves to develop sources of cast parts that have not been investment cast before, it will have done its job.

They're small . . .

They're intricate . . .

They're tight on tolerances . . .

They're subject to destructive service . . .

They're money-savers when they are Inco precision-cast!

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Looking for the most economical method of production, the manufacturer talked over precision investment casting with Inco. The part seemed a "natural": small . . . intricate . . . tight on tolerances.

They were right! Precision-cast by Inco, the part requires only *one* machining step . . . drilling a hole.

Here's how you can save: Whenever you have a high-melting-point metal part which is 6 inches x 5 inches or smaller, weighs under 3 lbs., required starting tolerances as close as plus or minus .005 inch per linear inch, and needs 5 or more fabrication steps, look into Inco precision casting. It often gives required precision with less machining.

Send us a sample or blueprint. Our Engineering Department will be glad to submit their recommendations and quotations on Inco precision investment castings.

*Registered trademark

5 Advantages of Inco Precision Castings

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- **Longer life with harder alloys.**
- **Little or no machining required.**
- **Wider design latitude.**
- **Higher alloys at lower cost.**

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Advanced Jewelry Casting Co.
Aero Investment Castings Co.
All-Metals Precision Casting Corp.
Alloy Precision Castings Co.
W. H. Anderson Co., Inc.
Arrow-Acme Corp.
Arwood Precision Casting Corp.
Bone Engineering Corp.
Brace, Inc.
Budd-Stanley Co., Inc.
Cadmet Corp.
California Precision Castings, Inc.
Castalloy Corp. of Illinois
Casting Engineers, Inc.
Centrifugal Casting Co.
Crestline Products Co.
L. G. Daniels Co.
Dean Precision Castings, Inc.
Duncan-Rohne & Co.
Econocast Corp.
Engineered Precision Casting Co.
F-R Machine Works, Inc.
Ferriot Bros., Inc.
Ferro Cast Corp.
Gowin & Keleher, Inc.
Gray-Syracuse, Inc.
Hampshire Casting Co.
Harcast Co.
Hitchiner Mfg. Co., Inc.
Howard Foundry Co.
Humphrey Castings, Inc.
Illinois Precise Casting Co.
Industrial Casting Corp.
Industrial Fine Castings Ltd.
Investment Casting Co. (N. J.)
Investment Casting Co. (Pa.)
Jelrus Precision Casting Corp.
Joseff
Kolcast Industries, Inc.
Lawrence Laboratory
Liebros Casting Co., Inc.
Linton Precision Casting Co.
Lynn Casting Corp.
M & M Precision Casting, Inc.
Martin Mfg. Co.
Mercast Mfg. Corp.
Midwest Precision Castings Co.
National Precision Casting Corp.
Nilsen Mfg. Co.
Electronicast Div.
Northern Precision Casting Co., Inc.
Omni-Metal Castings, Inc.
Paramount Precision Casting Co.
Perfect Casting
Perficast, Inc.
Picco, Inc.
Precision Castparts Co.
Precision-Cast Products Co.
Precision Metal Products Co., Inc.
Precision Metalsmiths, Inc.
Rausch Mfg. Co.
Rimer Precision Castings Inc.
Rode, Inc.
Frank Roth Co., Inc.
Scientech Co.
Scott Casting & Mfg. Corp.
Standard Tool Co.
Supreme Precision Castings Ltd.
Tectron, Inc.
K. W. Thompson Tool Co.
Universal Castings Corp.
Wade Mfg. Corp.
Whip-Mix Corp.
Witkin Precision Castings
N. A. Woodworth Co.
York Castings, Inc.
Z & H Mfg. Corp.
Zenith Precision Casting Co., Inc.

Cobalt Alloys

W. H. Anderson Co., Inc.
Arwood Precision Casting Corp.
Austenal, Inc.
Bone Engineering Corp.
California Precision Castings, Inc.
Castalloy Corp. of Illinois
Casting Engineers, Inc.
Crestline Products Co.
Crucible Steel Co. of America
Dean Precision Castings, Inc.
Deloro Stellite
Duncan-Rohne & Co.
Econocast Corp.
Engineered Precision Casting Co.
F-R Machine Works, Inc.
Fallon Industries
Vac-Alloys Div.
Ferro Cast Corp.
Frankel Co., Inc.
General Electric Co.
Gowin & Keleher, Inc.
Gray-Syracuse, Inc.
Harcast Co.
Haynes Stellite Co.
Hitchiner Mfg. Co., Inc.
Howard Foundry Co.
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Industrial Fine Castings Ltd.
International Nickel Co., Inc., The
Investment Casting Co. (N. J.)
Jelrus Precision Casting Corp.
Joseff
Kolcast Industries, Inc.
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National Precision Casting Corp.
Northern Precision Casting Co. Inc.,
Omni-Metal Castings, Inc.
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Precision Castparts Co.
Precision Metal Products Co., Inc.
Precision Metalsmiths, Inc.
Rimer Precision Casting, Inc.
Frank Roth Co., Inc.
Scott Casting & Mfg. Corp.
Sigourney Mfg. Corp.
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Tectron, Inc.
K. W. Thompson Tool Co.
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Westinghouse Electric Corp.
Blairsville Metals Plant
Whip-Mix Corp.
York Castings, Inc.

Copper Alloys

Advanced Jewelery Casting Co.
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All-Metals Precision Casting Corp.
Alloy Precision Castings Co.
W. H. Anderson Co., Inc.
Arwood Precision Casting Corp.
Ralph W. Biggs & Co., Inc.
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Nickel Alloys

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Arwood Precision Casting Corp.
Austenal, Inc.
Bone Engineering Corp.
Brace, Inc.
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California Precision Castings, Inc.
Castalloy Corp. of Illinois
Casting Engineers, Inc.
Crestline Products Co.
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Dean Precision Castings, Inc.
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Liebros Casting Co., Inc.
Linton Precision Casting Co.
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Midwest Precision Castings Co.
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National Precision Casting Corp.
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Omni-Metal Castings, Inc.
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K. W. Thompson Tool Co.
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Blairsville Metals Plant
Whip-Mix Corp.
Witkin Precision Castings
N. A. Woodworth Co.
York Castings, Inc.
Zenith Precision Casting Co., Inc.

Tool Steel

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All-Metals Precision Casting Corp.
Alloy Precision Castings Co.
W. H. Anderson Co., Inc.
Arwood Precision Casting Corp.
Austenal, Inc.
Bone Engineering Corp.
Brace, Inc.
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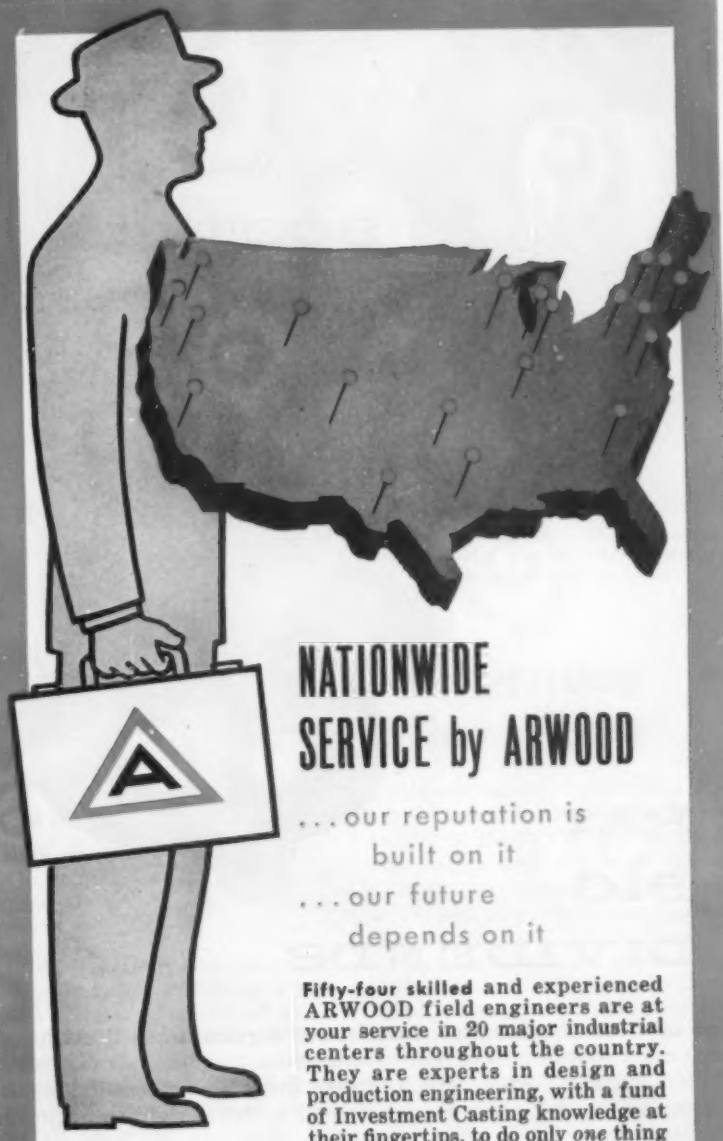
California Precision Castings, Inc.



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Joseff
Kolcast Industries, Inc.
Liebros Casting Co., Inc.
Linton Precision Casting Co.
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Mercast Mfg. Corp.
Midwest Foundry
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Misco Precision Casting Co.
National Precision Casting Corp.
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Electronicast Div.
Northern Precision Casting Co., Inc.
Omni-Metal Castings, Inc.
Paramount Precision Casting Co.
Perfect Casting
Picco, Inc.
Precision Castparts Co.
Precision Metal Products Co., Inc.
Precision Metalsmiths, Inc.
Rimer Precision Casting, Inc.
Frank Roth Co., Inc.
Scott Casting & Mfg. Corp.
Sigourney Mfg. Corp.
Supreme Precision Castings Ltd.
Tectron, Inc.
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Blairsville Metals Plant
Whip-Mix Corp.
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(Alnico)
L. G. Daniels Co.
(zinc)
Ferriot Bros., Inc.
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Howard Foundry Co.
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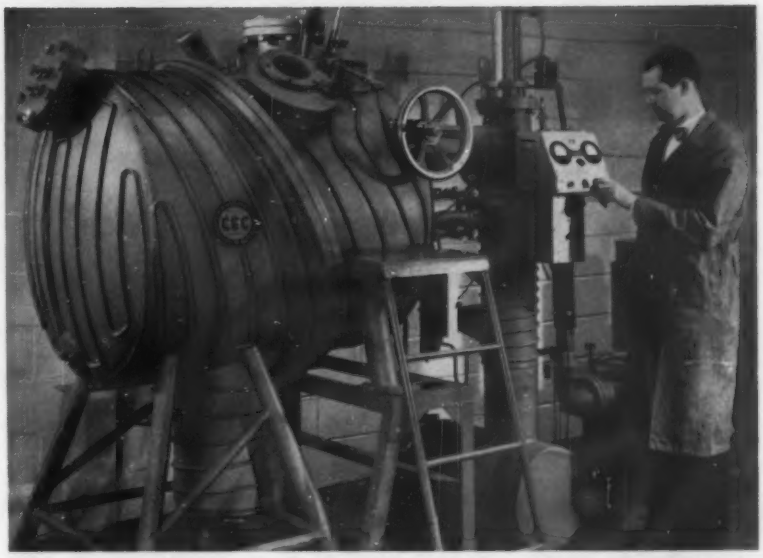

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Complete controls: A manual bridge-breaker assembly is combined with a water-cooled, nonfogging sight tube for optical pyrometry. A sampling device and a thermocouple assembly are standard accessories. Interlocking of the pneumatic vacuum line valves makes for safe and proper cycling.

The mold well is water-cooled. Electric feedthroughs are provided for mold heating.

Ample pumping: A 2-stage diffusion-ejector pump brings the system swiftly to the low micron Hg pressure range, with plenty of reserve capacity for pressure surges from alloy additions, deoxidation, and pouring.

Write for illustrated bulletin No. 4-30 that lists complete specifications, accessories, and design features of this remarkably versatile furnace.

Open furnace shows crucible and coil assembly. Mold chamber has deep well and (optional) indexed table for multiple molds.

Consolidated Electrodynamics
Rochester Division, Rochester 3, N. Y.
formerly Consolidated Vacuum

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

For more information circle No. 29 on the Reader Service Card

Bakelite Co.
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Bareco Wax Co.
Div. of Petrolite Corp.
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Castalloy Corp. of Illinois
(wax, plastic)
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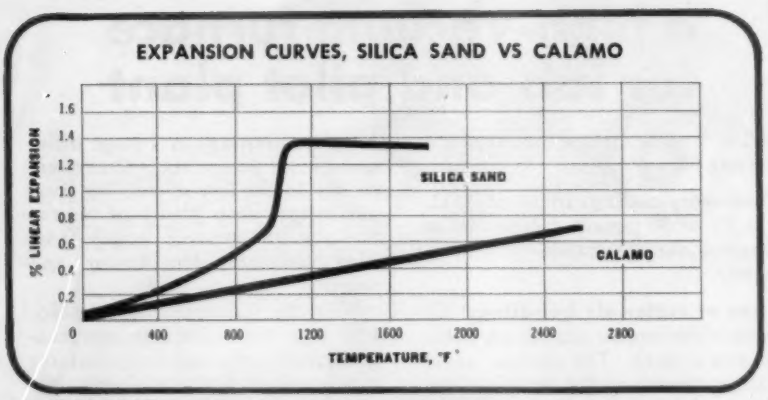
(wax, plastic, pattern die materials, parting compounds and mold washes)
Crestline Products Co.
(wax, plastic)
Denton Precision Casting Co.
(wax, parting compounds and mold washes)
Joseph Dixon Crucible Co., The
(mold washes)
Dura Commodities Corp.
(wax, plastic)
J. I. Holcomb Mfg. Co.
Pattern Materials Div.
(wax)
Kerr Mfg. Co.
(wax, parting compounds and mold washes)
Lava Crucible-Refractories Co.
(mold washes)
Martin Mfg. Co.
(wax, plastic)
Norton Co.
(aluminum oxide, zirconium oxide and magnesium oxide parting compounds and mold washes)
Pal Engineering Ltd.
(wax, plastic, pattern die materials)
Cerro de Pasco Sales Corp.
(pattern die materials)
Perma-Flex Mold Co., The
(pattern die materials, parting compounds and mold washes)
Ransom & Randolph Co., The
(wax)
Alexander Saunders & Co.
(wax, pattern die materials)
Scientech Co.
(plastic, pattern die materials)
Tamms Industries, Inc.
(pattern die materials, parting compounds and mold washes)
Wasco Laboratories
(wax, plastic, parting compounds and mold washes, water soluble wax)
Yates Dental Mfg. Co.
(wax)

HARBISON-WALKER

REFRACTORY

Mold Materials

for precision metal casting



CALAMO, one of the extensively used Harbison-Walker products for investment molding is an alumina-silica refractory of optimum sizings for various particular mixtures. Its fusion point is 100°F. higher than that of normal silica sand mixes.

The chart above shows the exceedingly desirable expansion curve of CALAMO as compared with that of silica sand. CALAMO used as the major constituent of investment mixes, improves the dimensional constancy of the molds and makes them stronger and more resistant to erosion.

With CALAMO, over-all investment costs are measurably reduced because an appreciably lesser amount of bonding agent is needed. This is attributable to the very desirable particle sizing and equiaxed, dense grains of CALAMO.

H-W MOLDSAND BOND is a highly refractory clay having unusual plasticity and bonding strength. Used alone or with other binders, it imparts enhanced hot strength to molds, and in some mixes replaces, wholly or in part, binders of higher cost. It is used with equally good results for rammed mixes with sand and Calamo. Molding mixes made with H-W MOLDSAND BOND have decidedly improved storage properties.

Write us for information regarding other Harbison-Walker products — mold wash materials — ceramic molding media — shell molding minerals.

HARBISON-WALKER REFRACTORIES COMPANY
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Electro Refractories & Abrasives Corp.
(cut-off wheels)
Norton Co.
(abrasive blast, cut-off wheels, barrel tumbling, abrasive belts)
Pal Engineering Ltd.
(abrasive blast, cut-off wheels, barrel tumbling, abrasive belts)
Pangborn Corp.
(abrasive blast)
Alexander Saunders & Co.
(abrasive blast, cut-off wheels, barrel tumbling, abrasive belts)

Casting Equipment

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Axel Plastics Research Laboratories
(vacuum, gravity)
British Machine & Foundry Supplies
(gravity)
Centrifugal Casting Supply Co.
(centrifugal, vacuum)
Denton Precision Casting Co.
(centrifugal)
Ecco High Frequency Corp.
(centrifugal)
Ferriot Bros., Inc.
(vacuum)
Joseff
(centrifugal, vacuum)
Manco Products, Inc.
(pressure)
NRC Equipment Corp.
(vacuum)
Pal Engineering Ltd.
(centrifugal, gravity)
Alexander Saunders & Co.
(centrifugal, vacuum, gravity)
F. J. Stokes Corp.
(vacuum)
United Refining & Smelting Co.
(vacuum, gravity)

Crucibles

Ajax Electrothermic Corp.

American Refractories & Crucible Corp.
Arrow-Acme Corp.
British Machine & Foundry Supplies
Denton Precision Casting Co.
Joseph Dixon Crucible Co., The
Electro Refractories & Abrasives Corp.
Harbison-Walker Refractories Co.
Lava Crucible-Refractories Co.
Norton Co.
Ross-Tacony Crucible Co.
Alexander Saunders & Co.
Surface Combustion Corp.
United Refining & Smelting Co.
Vesuvius Crucible Co.
Zirconium Corp. of America

Furnace Refractories

Ajax Electrothermic Corp.
American Refractories & Crucible Corp.
British Machine & Foundry Supplies
Centrifugal Casting Supply Co.
Joseph Dixon Crucible Co., The
Electro Refractories & Abrasives Corp.
Harbison-Walker Refractories Co.
Kuhlman Electric Co.
Detroit Electric Furnace Div.
Lava Crucible-Refractories Co.
Norton Co.
Pal Engineering Ltd.
Ross-Tacony Crucible Co.
Alexander Saunders & Co.
Surface Combustion Corp.
United Refining & Smelting Co.
Zirconium Corp. of America

Furnaces: Burnout

British Machine & Foundry Supplies
Centrifugal Casting Supply Co.
Denton Precision Casting Co.
Alexander Saunders & Co.
Surface Combustion Corp.

Furnaces: Melting

Ajax Electrothermic Corp.
(induction)
Arrow-Acme Corp.
(fuel fired)
British Machine & Foundry Supplies
(carbon arc)
Consolidated Electrodynamics
Rochester Div.
(vacuum)
Ecco High Frequency Corp.
(induction)
Inductotherm Corp.
(induction)
Kuhlman Electric Co.
Detroit Electric Furnace Div.
(carbon arc)
Lepel High Frequency Laboratories, Inc.
(induction)
Ohio Crankshaft Co., The
Tocco Div.
(induction)
Pal Engineering Ltd.
(induction)
Alexander Saunders & Co.
(fuel fired, induction, carbon arc)
Surface Combustion Corp.
(fuel fired)
United Refining & Smelting Co.
(fuel fired)

Pattern Equipment

All-Metals Precision Casting Corp.
(wax melters, wax injectors)
Arrow-Acme Corp.
(flasks)

Cast in stainless steel, this nozzle ring for a rocket engine represents the ultimate in intricate casting design. The absolute accuracy of core placement, its close tolerances, its thin metal sections, its internal quality—these exacting requirements foreshadow the foundry techniques of tomorrow, now being employed at Lebanon *today*.

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CIRCLE L

Write for Lebanon's Design File "F"

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Denton Precision Casting Co.
(wax injectors, flasks)
Ferriot Bros., Inc.
(plastic molding presses)
Joseff
(wax melters, wax injectors, flasks)
Pal Engineering Ltd.
(plastic molding presses)
Reed-Prentice Corp.
(plastic molding presses)
Alexander Saunders & Co.
(wax melters, wax injectors, plastic molding presses, flasks)
Standard Tool Co.
(plastic molding presses)
Sta-Warm Electric Co.
(wax melters)
F. J. Stokes Corp.
(plastic molding presses)
Van Dorn Iron Works Co.
(plastic molding presses)

Vacuum Equipment

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(melting)
Axel Plastics Research Laboratories
(investment de-airing)
Centrifugal Casting Supply Co.
(investment de-airing)
Consolidated Electrodynamics Rochester Div.
(melting)
Denton Precision Casting Co.
(investment de-airing)
Ferriot Bros., Inc.
(degassing, investment de-airing)
NRC Equipment Corp.
(degassing, investment de-airing, melting)
New York Air Brake Co., The
Vacuum Equipment Div.
(degassing, investment de-airing, melting)
Alexander Saunders & Co.
(investment de-airing)
F. J. Stokes Corp.
(degassing, melting)
United Refining & Smelting Co.
(melting)
Whip-Mix Corp.
(mixers)

METALS & ALLOYS

(I-B-S — Ingot, Bar, Shot)

..Aluminum Alloys

Alloys & Chemicals Mfg. Co. (I)
Aluminum Smelting & Refining Co. (I)
American Smelting & Refining Co. (I)
Federated Metals Div.
Apex Smelting Co. (I)
Belmont Smelting & Refining Works (I)
Pal Engineering Ltd.
U. S. Reduction Co. (I)

Cobalt Alloys

Cannon-Muskegon Corp. (I-B-S)
Crucible Steel Co. of America (I-B-S)
Deloro Stellite (I-S)
Frankel Co., Inc. (I-B-S)
General Electric Co. (I)
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M. A. Young & Co. (I-S)

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Pal Engineering Ltd.
Shields & Co. (S)
Vascoloy-Ramet Corp. (I)

Low Alloy Steels

Cannon-Muskegon Corp. (I-B-S)
General Electric Co. (I)
Vascoloy-Ramet Corp. (I)
WaiMet Alloys Co. (I-B-S)
M. A. Young & Co. (I-S)

Magnesium Alloys

Pal Engineering Ltd.

Nickel Alloys

Cannon-Muskegon Corp. (I-B-S)
Frankel Co., Inc. (I-B-S)
General Electric Co. (I)
Haynes Stellite Co. (S)
Shields & Co. (S)
WaiMet Alloys Co. (I-B-S)
M. A. Young & Co. (I-S)

Stainless Steels

Armco Steel Corp. (I-B)
Cannon-Muskegon Corp. (I-B-S)
Crucible Steel Co. of America (I-B-S)
Charles Dreifus Co. (I)
Frankel Co., Inc. (I-B-S)
General Electric Co. (I)
Haynes Stellite Co. (S)
Alexander Saunders & Co. (shearings)
Vascoloy-Ramet Corp. (I)
WaiMet Alloys Co. (I-B-S)
M. A. Young & Co. (I-S)

Tool Steels

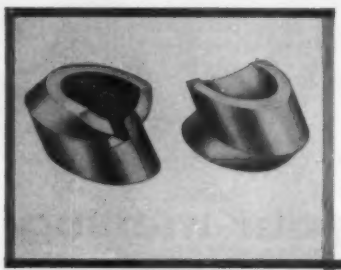
Cannon-Muskegon Corp. (I-B-S)
Crucible Steel Co. of America (I-B-S)
Frankel Co., Inc. (I-B-S) (18-4-1, 6-6-2)
General Electric Co. (I)
WaiMet Alloys Co. (I-B-S)
M. A. Young & Co. (I-S)

Others

Armco Steel Corp. (I-B) (Armco 17-4PH)
Brush Beryllium Co., The (I-B-S) (beryllium copper alloys, beryllium nickel alloys, beryllium aluminum alloys)
Cannon-Muskegon Corp. (I-B-S) (vacuum melted alloys)
Haynes Stellite Co. (S) (iron base alloys)
Penn Precision Products, Inc. (I) (beryllium copper alloys)
Shields & Co. (precious metals)
L. E. Simmons Refining Co. (I-B-S) (precious metals)
United Refining & Smelting Co. (I-B-S) (bismuth-tin alloys, bismuth-lead-tin-cadmium alloys, cadmium-bismuth alloys)
WaiMet Alloys Co. (I-B-S) (universal grades)
M. A. Young & Co. (I-S) (titanium alloys)

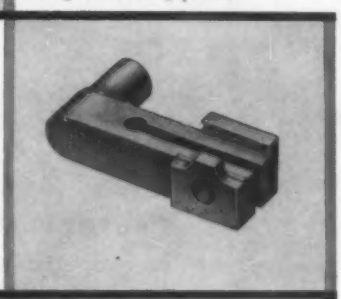
Basic Considerations in Selecting alloys . . . . for your INVESTMENT CASTINGS

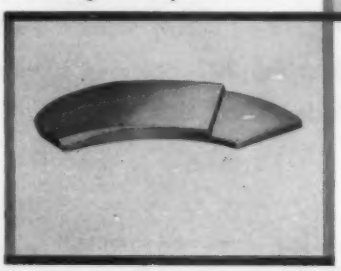
DO YOU KNOW THAT . . . an investment casting produced from a low cost metal may be MORE EXPENSIVE than one cast from higher priced material that may also have characteristics better suited to your requirements.



These angle connectors were originally investment cast in mild steel, a low cost material. To overcome corrosion problems, 303 stainless was substituted and because of its better castibility there was no increase in cost. Now, silicon brass is being used at a 10% saving on the original selling price.

This gage mount is an excellent example of unusually good casting characteristics of one metal offsetting a decidedly higher material cost. Originally priced in SAE 8620 steel, it was changed to beryllium copper at a 15% saving in unit price.





This simple textile machine part requires a high degree of wear resistance. Casting in the right metal provided better properties at lower cost than when machined from tool steel.

Get more complete information for this is only a small part of the story telling how the right metal selection for investment castings can often increase efficiency and reduce costs.

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- **O-U** COLD WORK OIL HARDENING
- **D-U** COLD WORK AIR HARDENING
- **H-U** HOT WORK AIR HARDENING
- **T-U** HIGH SPEED TUNGSTEN BASE
- **M-U** HIGH SPEED MOLYBDENUM BASE

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Moorestown, N.J.
(investment castings)

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(investment castings)

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Vac-Alloys Div.
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(investment castings)

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Manlius, N.Y.
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Easthampton, Mass.
(investment castings)

Harcast Co.
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Glenolden, Pa.
(investment castings)

Haynes Stellite Co.
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Kokomo, Ind.
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Industrial Fine Castings Ltd.
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New York, N.Y.
(investment castings)

Investment Casting Co.
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Springfield, N.J.
(investment castings)

Investment Casting Co.
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Santa Monica, Cal.
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(investment castings)

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Burbank, Cal.
(investment castings)

M & M Precision Casting, Inc.
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(investment castings)

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Melvindale, Mich.
(investment castings, casting equipment)

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Richmond, Tex.
(investment castings, pattern materials)

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La Verne, Cal.
(investment castings)

Midwest Foundry
Div. of L. A. Darling Co.
Coldwater, Mich.
(investment castings)

Midwest Precision Castings Co.
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Cleveland, O.
(investment castings)

Misco Precision Casting Co.
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Whitehall, Mich.
(investment castings)

National Precision Casting Corp.
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Clifton Heights, Pa.
(investment castings)

Nilsen Mfg. Co.
Electronicast Div.
21 N. Church
Addison, Ill.
(investment castings)

Northern Precision Casting Co., Inc.
Pell Lake, Wis.
(investment castings)

Omni-Metal Castings, Inc.
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Brooklyn, N.Y.
(investment castings)

Paramount Precision Casting Co.
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Chicago, Ill.
(investment castings)

Perfect Casting
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(investment castings)

Perficast, Inc.
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New York, N.Y.
(investment castings)

Picco, Inc.
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El Monte, Cal.
(investment castings)

Precision Castparts Co.
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Portland, Ore.
(investment castings)

Precision-Cast Products Co.
736 Arch
Philadelphia, Pa.
(investment castings)

Precision Metal Products Co., Inc.
P.O. Box 98
Gurley, Ala.
(investment castings)

Precision Metalsmiths, Inc.
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Cleveland, O.
(investment castings)

Rausch Mfg. Co.
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St. Paul, Minn.
(investment castings)

Rimer Precision Casting, Inc.
Farnsworth Rd.
Waterville, O.
(investment castings)

Rode, Inc.
R 5 Green St.
Woburn, Mass.
(investment castings)

Frank Roth Co., Inc.
4280 Park Ave.
Bronx, N.Y.
(investment castings)

Scientech Co.
Box 511, 812 Hill St.
Independence, Kans.
(investment castings, pattern materials)

Scott Casting & Mfg. Corp.
Fourth St. & Cannon Ave.
Lansdale, Pa.
(investment castings)

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Los Angeles, Cal.
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(investment castings, melting furnaces, crucibles, refractories, casting equipment, vacuum equipment, bismuth-tin alloys, bismuth-lead-tin-cadmium alloys, cadmium-bismuth alloys)

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Div. of Petrolite Corp.
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Tulsa, Okla.
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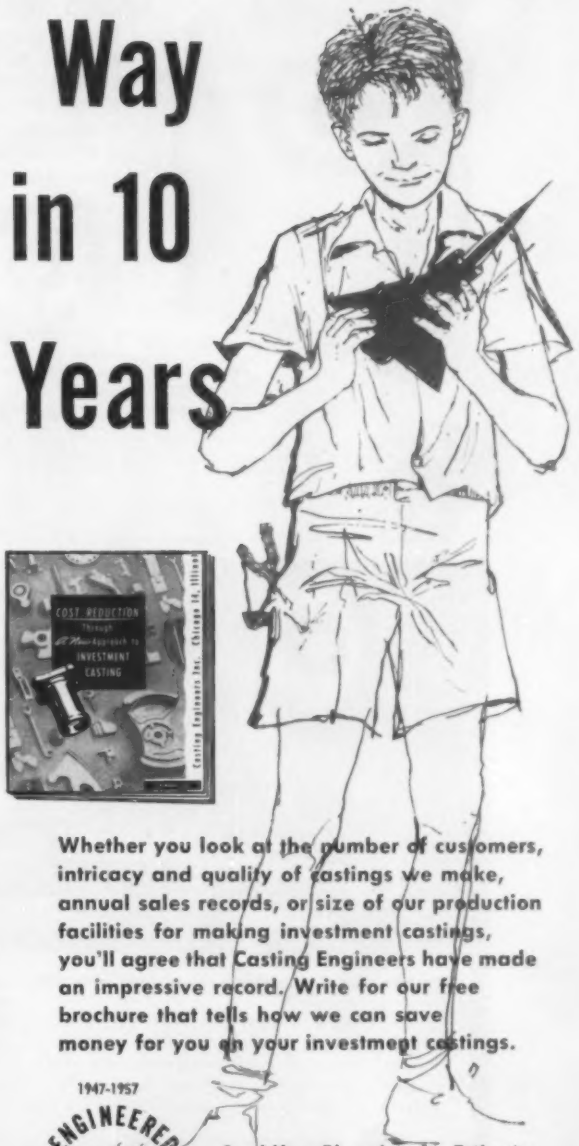

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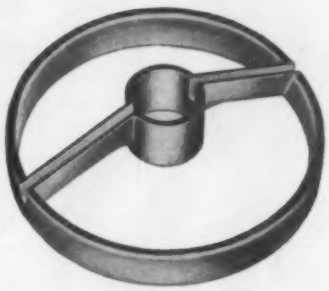

Illustrated above is a simple problem for the investment caster to solve although a very difficult and expensive problem if approached by any other method. While this actual order was filled with the part made from 356 aluminum alloy, there is no reason why it could not have been cast from one of the bronze alloys or even a stainless steel alloy.

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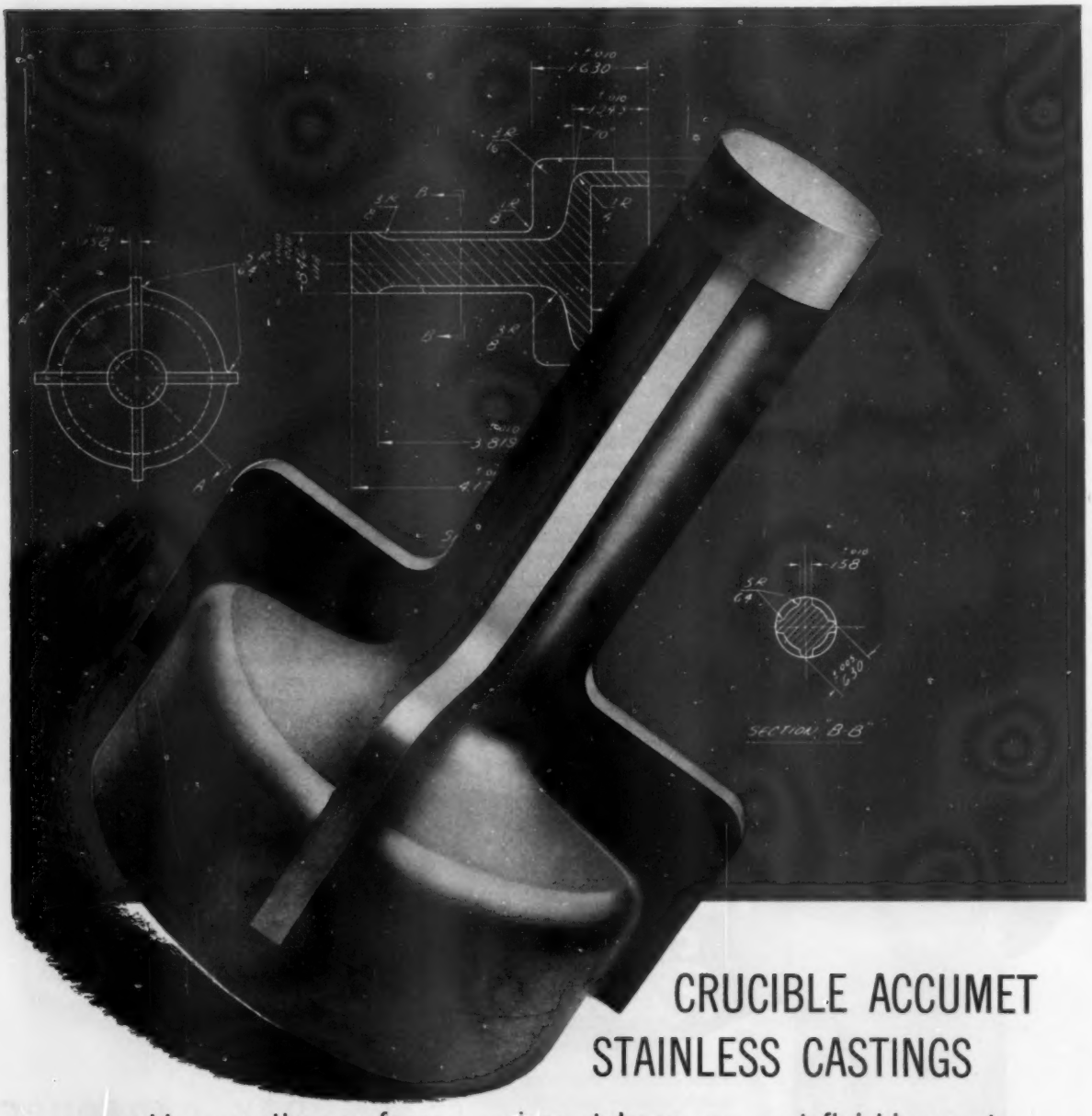

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(pattern equipment)

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(investment binders)

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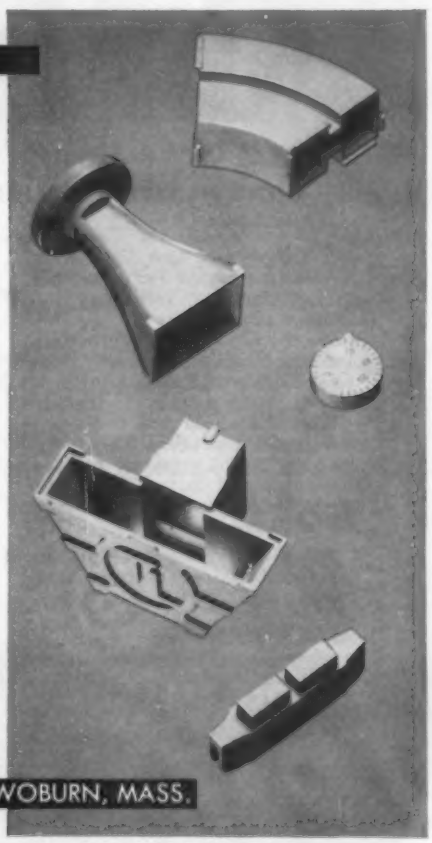

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(low alloy steels, tool steels, stainless steels, nickel alloys, cobalt alloys, titanium alloys)

FREE LITERATURE—continued

Continuous Production Furnaces: 224
Harper Electric Furnace Corp., two 4-page bulletins. Bulletin No. 1054 describes a complete line of furnaces designed for continuous production. Bulletin No. 454 describes mesh belt conveyor furnaces for continuous processing.

Iron Powders: 225
Hoeganaes Sponge Iron Corp., two 4-page bulletins. Bulletin No. 108 outlines the company's test-bar service to determine the best composition for individual sintering conditions. A second bulletin gives technical data on sponge iron powder "MH-100."

Heat Treating, Cooling: 226
Ipsen Industries, Inc., three product data bulletins. Bulletin T-40 describes the company's "Series TFC" automatic heat treating units with controlled atmosphere cooling. Bulletin T-19A describes the automatic "A" model, 100 percent forced convection heat treating units, and Bulletin No. G-56N describes gas-fired and electric endothermic generators.

Iron Powders: 230
Plastic Metals Div. of National-U.S. Radiator Corp., three bulletins. Bulletin No. 1 describes the wide range of applications for iron powders in various grades. Bulletin No. 2 gives complete information on the production and use of iron powders, fully illustrated. Bulletin No. 3 gives technical data on "Plast-Iron" Grade B-261, including a chart of strength and growth properties with and without copper and graphite.

Nonferrous Metal Powders: 231
The New Jersey Zinc Co., two bulletins. A four-page technical bulletin describes "The Use of Brass and Other Nonferrous Powder Parts." Outstanding features, applications, and design data on sintering are covered. A recent issue of the company's "Metal Powder Press" describes further uses for nonferrous powders.

Powder Metal Parts: 232
Parker White Metal Co., single-page reprint. The elimination of machining and scrap metal costs in the production of small, complex parts is described and illustrated.

Sintered Parts: 233
Pegasus International Corp., 8-page reprint. Technical information on the rapid and economical production of intricate structural or working parts by powder metallurgy is given in an article entitled "Sintered Components."

Iron Powders: 234
Republic Steel Corp., 16-page bulletin plus two reprints. Bulletin No. 763 gives technical information on the company's three grades of iron powders, with their "CDF" feature explained. Included are 18 design pointers for powdered metal parts.

Prealloyed Steel Powders: 235
Vanadium-Alloys Steel Co., 4-page reprint. A fully-illustrated article tells how clean, speedy, accurate melting helps make prealloyed steel powder. The manufacturing process is fully outlined.

Copper Powder: 236
Whitaker Metals Corp., single-page specification and price sheets. Complete specifications are given on the company's type WM170-90 copper powder, and a price sheet gives prices for various quantities of four copper powder types.

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How To Calculate Die Casting Output

By F. C. Bennett*

F. C. Bennett

THE rapid growth of the pressure die casting industry has been described in various publications [1-2-3] where it has been shown that the total sales value of the products now approximates $650,000,000 per year. The spectacular increase in the use of die castings in the last decade reflects customer satisfaction with the design flexibility, quality, and price of the product. This trend has been supported by technical improvements in the design of the dies, casting machines, and metal supply systems.

For the average die caster progress in die design has resulted from production casting experience without enough thought being given to the theoretical aspects of the process. Even the literature reflects this kind of an empirical approach by presenting detailed descriptions of mechanical solutions to a host of casting problems. Under these conditions the die caster becomes a kind of "cut-and-try" trouble-shooter whose effectiveness reflects his experience with similar situations in the past. He knows that a hot spot in the die can be cooled by lubricant, an air stream, or a spot cooler, but he rarely anticipates such difficulties or attempts to predict the casting rate at which the problem will occur. As the machine output rates are increased by new metal feeding techniques, methods for heat extraction from dies become more critical. Therefore, as better dies are built, the quantity and quality of die casting production should be improved thus lowering the cost and widening the scope. This discussion represents a beginning toward a better understanding of casting die performance.

*Chief, Die Casting Section
The Dow Chemical Co.

What is casting?

When a casting process is reduced to the simplest terms, one might describe it as a method for imparting a useful shape to molten metal while removing the heat associated with its solidification. The emphasis has always been concentrated upon the useful shape being produced following the traditional thinking of the sand foundry. With the sand mold process the chief problem is to properly remove the solidification heat from a single casting. The permanent mold and pressure die casting methods have this problem plus the problems of heat removal introduced by repetitive cycling of the mold.

Heat balance

Since the molten metal charge often enters a casting die hundreds of degrees hotter than the cavity space and with the velocity of a slow bullet, it is not easy to associate any state of equilibrium with the process, yet that is the next step required of the reader. If one views a casting machine as a device to remove the solidification heat from a certain weight of metal every hour, the equilibrium concept is a great deal easier to accept. The temperature of the melt, the heat release during solidification, and the casting ejection temperature are all values that are known or can be measured. For a steady repetitive cycle of casting we can therefore easily calculate the total input to the casting die per unit of time.

The law of conservation of energy suggests that this heat plus a small amount generated mechanically must be removed from the mold in the same space of time. In other words a heat balance must be achieved to establish an equilibrium die face temperature. If this balance is disturbed, the die temperature will rise or fall depending upon an excess of heat input or cooling effect. If the cooling capacity

of a given die is exceeded, the die temperature will rise until heat defects become evident in the casting. Slow operation, or over-cooling, will result in a cold die and related difficulty such as cold flow lines. It has already been stated that we can predict the heat input to a die at any given casting rate. If we could calculate the heat removal capacity for a casting die it would then be possible to predict the equilibrium conditions which should be the proper casting rate for optimum results. This would indeed be very useful information for purposes of quotation, die design, and production.

HEAT RELEASE

Table I presents heat release calculations for three common die casting alloys under average operating conditions. Figures are given on both a volume and a weight basis for ease of calculation or comparison. To determine the heat input, H_i, to a casting die one may use the method indicated in Table II. We find it very convenient to plot the resulting information on a chart as shown in Table III. This chart can be readily constructed by calculating the heat input for a casting rate of 100 shots per hour and drawing a straight line to the origin. This straight line then represents the amount of heat which must be removed from the alloy being processed for any particular rate of production. Techniques for heat removal vary greatly from shop to shop so no detailed discussion of cooling methods will be presented in this article.

DIE ANALYSIS

To analyze the performance of an existing die one might make castings without turning on any water cooling at all. The peak rate at which good castings could be produced continuously might turn out to be something like 30 shots per hour representing a heat input of about 35,000 Btu/hr as shown by the vertical dotted line in Table III.

If the die is then operated with full water flow and calorimetric measurements are taken on the water, the peak rate might be 75 shots per hour with the heat removal pattern shown. The cover die water cooling is now doing the big job by removing 45,000 Btu/hr. The heat loss by conduction through the platens, radia-

ALLOY BASE ASTM ALLOY	Zn XXIII	Al SC84	Mg AZ91
MELT TEMP. °F	800	1200	1200
LIQUIDUS °F	727	1085	1100
SOLIDUS °F	717	970	875
EJECTION °F	400	870	775
TOTAL Δ°F	400	330	425
MEAN SPECIFIC HEAT (Btu/lb./°F)	0.10	0.35	0.33
SENSIBLE HEAT RELEASE (Btu/lb.)	40	115.5	140
LATENT HEAT OF FUSION (Btu/lb.)	43	169	159
TOTAL HEAT RELEASE (Btu/lb.)	83	284.5	299
ALLOY DENSITY (Lb./cu.in.)	0.24	.098	.063
TOTAL HEAT RELEASE, H_r (Btu/cu.in.)	20	27.9	18.8

TABLE I — Heat Released To Casting Dies

Let

h_r = Heat release per cubic inch of metal cast (Btu/cu.in.)
V = Cast volume (cubic inches)
N = Number of cycles or shots per hour
H_i = Total heat release to die (Btu/hour)
H_e = Total die heat losses (Btu/hour)

Then

$$H_i = h_r V N$$
$$H_i = H_e$$
$$H_e = h_r V N$$
$$N = \frac{H_e}{h_r V}$$

Maximum H_e is a function of die design and should be determined by experience in your own plant.

TABLE II — Thermal Limitation On Casting Rate

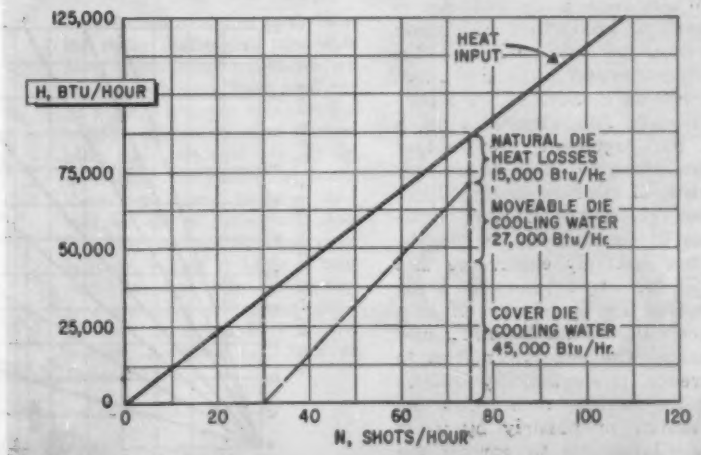

TABLE III — Casting Die Heat Balance

tion from the die space, and convection from all warm surfaces has decreased to 15,000 Btu/hr. At first glance this might appear unreasonable until one considers what has taken place in the mold. The temperature of the die in the vicinity of the water line has been lowered to stop much of the heat flow to the mold extremities. The temperature gradient has become abrupt to the water cooling line and gradual beyond that point. The net result is that the water picks up some of the heat formerly flowing into the platens or surrounding air.

An analysis such as the one described takes some of the mystery out of the die casting process. Suppose management desires an increase to 90 shots per hour peak rate with a proportionate increase in net production after due allowance has been made for lunch, fatigue, etc. Instead of wasting time in the casting plant one can now recognize that an increase in casting speed will only result in heat defects unless more die cooling is provided. How much do we need? Well, the 90 shot line (Table III) crosses the heat input curve at 105,000 Btu/hr. This represents an increase of 20,000 over the 85,000 total at 75 shots per hour. It is very likely that one could remove an additional 15,000 Btu/hr from the moveable die and another 5000 from the cover die by new water lines properly placed. The same goal might be achieved by increasing the size or changing the position of existing water lines.

When such a revised die is placed in production with more cooling, the new peak rate has been estimated from the curve permitting a check on shop performance. This eliminates much of the argument over output rates which has been so characteristic of most die casting shops, often creating personnel problems of considerable magnitude. It has been my experience that both the supervisor and the operator are frequently off base when output rates are under discussion. The supervisor tries to increase production by reducing the holding time below the minimum, or possibly by using fancy lubricants to correct the real error. The operator may have connected the water lines improperly or have them poorly regulated for peak production conditions. With the heat balance system the die performance can be predicted and then checked in the shop.

RATE PREDICTION

The prediction of die performance is essential for quotation purposes in all casting shops. Most die casters rely upon the long experience of an individual or a group of employees to guess how fast a proposed part can be cast. This system is of questionable accuracy even in some of the older organizations. New jobs beyond the scope of past experience are constantly popping up due to the expanding nature of the business.

Table IV takes a great deal of the guesswork out of the casting rate prediction. For example, a one pound magnesium casting running at 100 shots per hour will release 30,000 Btu per hour to the mold. Very little water cooling will be needed under these circumstances since we have already seen that natural heat losses will usually provide about this much cooling capacity. Let us suppose, however, that the job must be cast at 200 shots per hour to be profitable. Then we will need to remove 60,000 Btu per hour requiring more extensive liquid cooling.

It is true that the shape of the casting will have a significant bearing upon the rate problem. The ideal casting design calls for adequate, uniform wall sections with proper draft and provision for ejection. Under these conditions the predicted output rates will be realized without difficulty, but how about the jobs with heavy sections or thin walls?

Heavy sections represent a concentration of heat input which can be calculated or computed from Table IV. This localized heat input must be balanced by localized cooling of matched capacity. The procedure is similar to the placement of chills in a sand mold.

Thin sections present a different problem often overlooked by the average die designer. The low heat input makes it necessary to keep cooling lines out of the area except for very high production rates. Occasionally it is even necessary to provide heat in such areas to reduce the natural losses. It is relatively difficult to secure representative properties in die cast test bars because here, again, the low heat input dictates very rapid cycling or supplementary die heating to achieve the proper die temperature.

Table IV was constructed primarily for magnesium alloy but it can also be used for aluminum because the heat release to the die is approximately the same on a weight basis. For example, a one pound magnesium casting made in a die capable of 60,000 Btu per hour cooling would run 200 shots per hour. The same casting in aluminum would weigh one and one-half pounds, hence would run 133 shots per hour

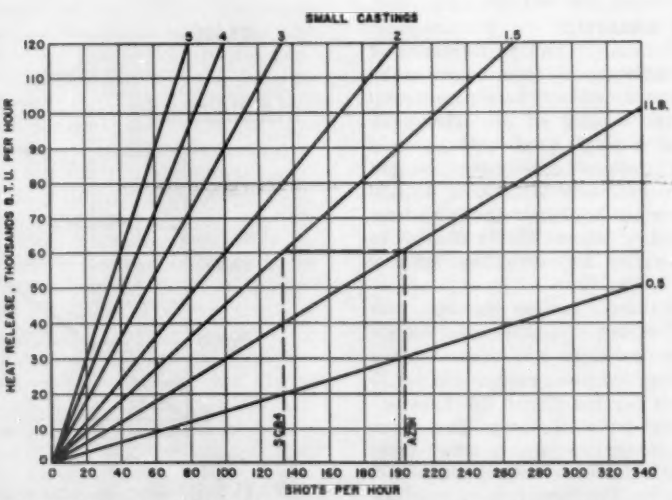

TABLE IV — Heat Release vs Shots Per Hour For Magnesium (300)

in the same die as shown by the dotted lines in Table IV. This adds considerable utility to the chart for die casters who supply both aluminum and magnesium castings.

The method I have described is based upon fundamental physical laws familiar to all and every step has been checked out in production practice with magnesium, zinc, and aluminum alloys. We have found the tables very helpful and so present them here in the hope that the information will be of real value to the die casting industry.

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(This paper was originally delivered before a meeting of the Cleveland chapter of The Society of Die Casting Engineers.)

HALSEY AND MACK ELECTED TO BOARD OF H-VW-M

Van R. Halsey and I. J. Mack have been elected to the board of directors of Hanson-Van Winkle-Munning Co., the firm announced today.

Halsey is a partner of Carlisle & Jacquelin, members of the New York Stock Exchange. He is a secretary of the board of trustees of St. Luke's Hospital, and a trustee of the Excelsior Savings Bank, both of New York City.

I. J. Mack is vice president in charge of the AGA Division of the Elastic Stop Nut Corp. of America, Elizabeth, N. J. He is director of Buchanan Electrical Products Corp., Hillside, N. J.; president of Esna Constructors, Inc., Elizabeth; and vice president and director of Gasaccumulator Co. (Canada) Ltd. of Toronto. He is a member of the Society of Automotive Engineers and the Institute of Traffic Engineers and serves on board of Youth Consultation Service of Newark, N. J.

ALLOY PRECISION CASTINGS APPOINTS WILLIAM L. WALLACE

William L. Wallace has been appointed Assistant to the Executive Vice President of Alloy Precision Casting Company, Cleveland, Ohio, it was announced today by Frank W. Glaser, Executive Vice President and General Manager. Mr. Wallace joined Alloy Precision Casting Company in March 1957. He holds both a Bachelor of Science and Engineering degrees from Yale University, and was formerly the Styling Administration Manager for the Ford Motor Company in Dearborn, Michigan.

FREE TRAINING MOVIE ON ALUMINUM FINISHING

A full color and sound, fifteen minute 16mm motion picture titled "Aluminum Finishing" has been completed by Turco Products, Inc., and is available for free showing to industrial concerns, technical groups and other interested organizations. The film, which is intended primarily for training purposes, visually demonstrates every aspect of aluminum finishing from pre-cleaning prior to conversion coating to painting and final assembly.

Actually filmed on location during the production of aircraft fuel tanks, the motion picture takes its viewers completely through the manufacturing.

When the run is short, the quality exacting

Look to Phoenix!

FOR ZINC DIE CASTINGS

Precision is a much misused word, but here at Phoenix, when we talk "Precision", it means just that. It means very close tolerances, it means extra close inspection of every piece produced, it means a completely acceptable job for our customers.

And, instead of shying away from the really challenging jobs with many operations, we thrive on them. In addition, there need not be a large quantity involved for it to be interesting. Our modern plant and personnel are set up specifically to handle intricate, short run repeat business, and that we do to perfection. And . . . our engineering department is ready, willing and able to help you solve any design or production problem you may encounter. So next time you have a low volume, precision job, look to Phoenix !

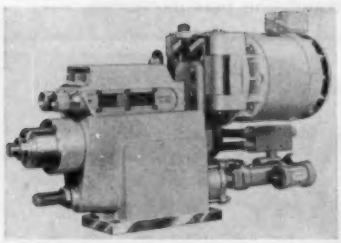
PHOENIX DIE CASTING CO.
21 ILLINOIS STREET BUFFALO, NEW YORK

For more information circle No. 69 on the Reader Service Card

NEW PRODUCTS AND DEVELOPMENTS

Want complete details on these announcements? Use the Reader Service Cards. You'll find them facing page 48 of this issue

HEAVY DUTY DRILL UNIT HAS 35 SPINDLE SPEEDS



A heavy duty drill unit has been designed as a complete production unit for high speed drilling, reaming, counter-boring, spot facing, and similar applications. Tapping can also be done with the addition of a tapping head.

Called the "Carbi-Drill," it can be mounted in any position. Powered by a standard two h.p. electric motor, the unit weighs 225 pounds. Thirty-five spindle speeds ranging from approximately 600 rpm to 6,000 rpm are available by changing the timing belt and motor pulley.

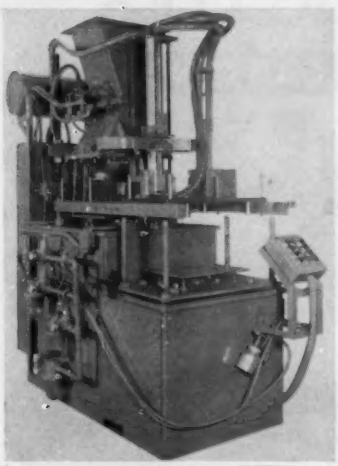
The drill features adjustable air-powered advance to the work, controlled hydraulic feed of the spindle, and adjustable air-powered rapid return. The controlled movements are accomplished with a Bellows air motor and hydrocheck incline power unit built into the base of the drill.

A 3⅝-inch bore aid motor supplies a power thrust to the quill of the drill of 10 times applied air line pressure.

Two external calibrated control knobs adjust the amount of rapid advance and depth of feed. Stroke length is adjustable from 1½ inches to four inches. Drilling capacity is up to ⅝ inch diameter drill in mild steel.

The Bellows Co.
For more information, circle No. 241 on the Reader Service Card

SHELL BLOWING MACHINE PRODUCES CORES, MOLDS WITHIN 30 SECONDS



By blowing resin-coated sand into electrically heated boxes, an automatic shell blowing machine produces shell cores or shell molds ready for use within 30 seconds.

Called the "Bio-Core" model H1-1622, the two-station, rotary unit can make hollow cores, solid cores, contoured shell molds, or liner cores. Shell cores up to 15 x 20 x 30 inches or shell molds up to 16 x 22 x 15 inches can be produced.

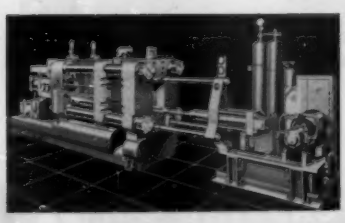
Special features of the machine include vertical or horizontal parting fixtures for handling hot core boxes or mold boxes, a hydraulic system with cam controls for rotation and positive indexing, a contactor panel with input controllers for maintaining constant and uniform temperature control of core and mold boxes, interlocked electrical operations, speed-controlled pneumatic operations, and semi-automatic or full automatic operation from a single push-button control panel.

The two stations operate 180 degrees from each other, and an unskilled operator operates the machine from a single position. The only manual operation is removal of finished shells from the machine every 30 seconds.

The machine occupies 36 square feet and weighs approximately 6800 pounds.

C & S Products Co., Inc.
For more information, circle No. 242 on the Reader Service Card

DIE CASTING MACHINES HAVE IMPROVED INJECTION ENDS



A new and improved line of high pressure, cold chamber die casting machines offer refinements in both the self-contained clamp and injection ends.

Available in 200, 400, 600, and 800 ton capacities, the machines feature a clamp link-wedge locking mechanism, plus extra heavy platens and tie rods, which lock and pre-load dies to rated tonnage. Heavy central screw adjustment is motorized and has push button operation for quick die set-up and tonnage control.

Compact design of the injection end and a unique hydraulic circuit which utilizes special valves and controls makes possible production of the most difficult castings with a minimum of "cut and try" on gates, vents, and overflow.

Pressures and press cycle controls are designed for recording so repeat set-ups can be made.

The Hydraulic Press Mfg. Co.
For more information, circle No. 243 on the Reader Service Card

Continues on page 112

You get speedier service from the

ZINC ZONE

Central location of American Zinc plants assures prompt deliveries of slab zinc to any point in the nation.

HILLSBORO, ILL., PLANT
Prime Western, Brass Special, Intermediate, High Grade, Continuous Galvanizing Grades
MONSANTO, ILL., ELECTROLYTIC PLANT
Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
FORT SMITH, ARK., SMELTER
Prime Western, Brass Special
DUMAS, TEXAS, SMELTER
Prime Western, Brass Special, Continuous Galvanizing Grades

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
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LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
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For more information circle No. 8 on the Reader Service Card

DRYING, POLISHING UNITS
. . . use hot sawdust

Hot sawdust drying and polishing units and accessory equipment are now available in three models to fit specific plant needs.

The barrel, with all welded construction of heavy gauge tailored steel, has a five cubic foot capacity and is finished in safety yellow. The units are equipped with ¼ HP, 110-volt, single phase gear motor with switch and gas venturi.

An elevator refill, standard on the "deluxe" model, can be used with all models or purchased as a separate accessory.

Speed-D-Burr Corp.
For more information, circle No. 244 on the Reader Service Card

PLATING ADDITIVE
. . . gives extra coverage

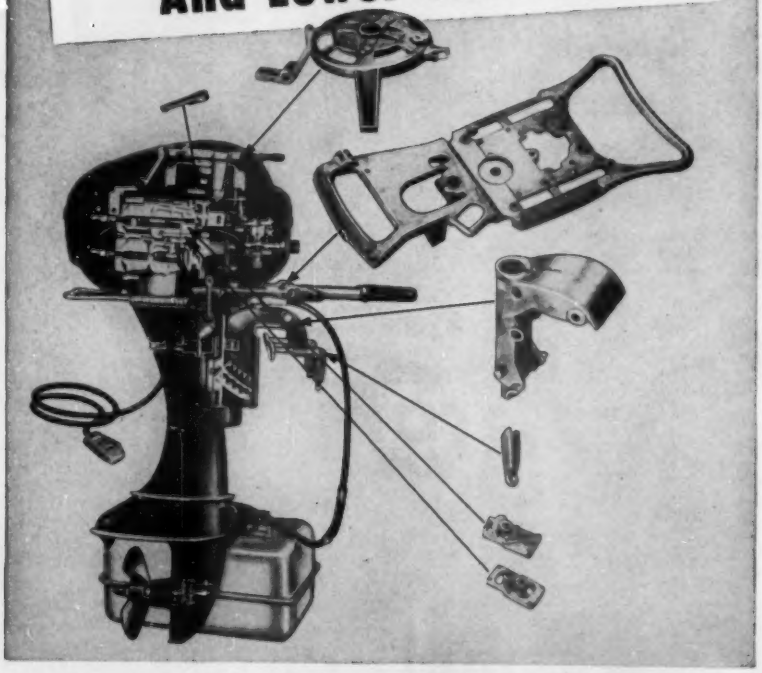
Additional covering power, less waste of chromic acid, safer working conditions, and reduced operating costs are the chief advantages reported for a recently-developed liquid addition agent for chrome plating baths.

When placed in a bath, the additive oxidizes into a complex mixture during electrolysis to enable the chrome bath to develop additional covering power. It also reduces chromic acid waste by decreasing spray, drag-out, and flue loss.

Called Krome-On, the additive does not alter the sulfate content of the chrome bath in any way, thus not disturbing the selected bath ratio. Other catalyst radicals in combination with the sulfate are also unaffected.

Wagner Bros., Inc.
For more information, circle No. 245 on the Reader Service Card

More Efficient Production, Better Product Performance And Lower Costs . . .



are reasons why SCOTT-ATWATER uses ACCURATE die castings

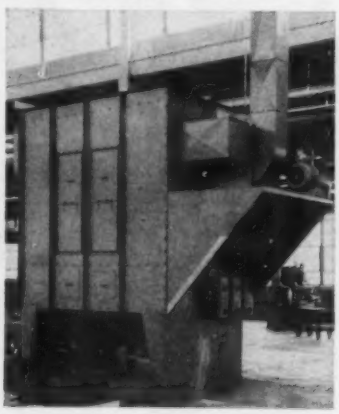
■ Because of their uniformity and light weight, ACCURATE die castings greatly reduced the time required for handling and assembly. Cast to close tolerances, they reduced or eliminated machining operations, special tooling and scrap loss. In addition, a more dependable and efficient motor was produced with die castings that have high strength-light weight properties and are non-porous and leakproof. Perhaps you too, can improve your product and profit picture with ACCURATE die castings. Write, wire or phone if you have a parts problem demanding immediate attention.

ALUMINUM • ZINC • MAGNESIUM DIE CASTINGS

ACCURATE DIE CASTING CO.
3089 E. 80th STREET • CLEVELAND 4, OHIO

For more information circle No. 3 on the Reader Service Card

DUST CONTROLLERS
. . . save space



A dust control system installed in a powdered metals fabricating plant is designed to provide efficient dust collection as well as conserve space.

Three collectors, ventilating different types of dust-creating operations, were included in one housing. The complete unit was located outside the building. One compartment of this unit handles collection of graphite dust, while the other two collect metallic dust. Each compartment has its own fan and piping system.

All collectors employ cloth filters as the air cleaning medium.

Wheelabrator Corp.
For more information, circle No. 246 on the Reader Service Card

WET BLAST UNIT
. . . includes rinsing, oiling

A conveyorized wet blast unit has been designed to incorporate complete rinsing and oiling cabinets.

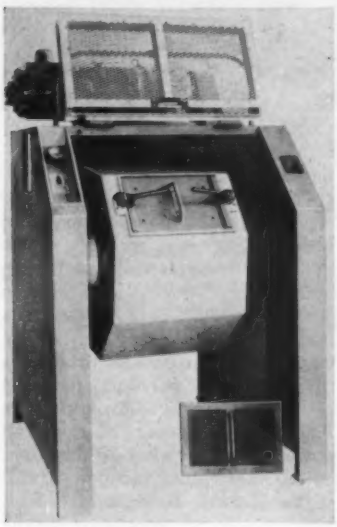
Originally designed for imparting a lubrication retentive surface to an automatic transmission component, the unit can be used on a variety of deburring, polish-

ing, and cleaning applications with a simple change in work-holding fixtures plus a repositioning of the blast guns.

Parts are loaded on spindles to the left of the installation, then successively indexed through the blast, rinse, and oiling sections. They are automatically unloaded by a small cam device at the extreme right. A production rate of 400 parts per hour is possible.

The Cro-Plate Co., Inc.
For more information, circle No. 247 on the Reader Service Card

FINISHING BARREL
. . . has variable speeds



A completely new finishing barrel has been designed for users requiring variable speeds.

The unit features a 22 by 33-inch barrel of welded steel plate with a capacity of 1,200 pounds. Available in either single or double compartment units, with or without neoprene linings, the barrel operates at a speed of seven to 30 RPM.

Among its safety devices and controls are a poppet type venting valve, a guard which functions as an automatic cut-off switch when raised, and recessed controls.

The Abbott Ball Co.
For more information, circle No. 248 on the Reader Service Card

TRIMMING PRESS
. . . handles larger dies

A 56-ton trimming press has been designed with oversize dimensions to accommodate larger dies.

Designated the Model 55, it will economically handle laminations, trimming of die castings, and similar bulky operations which would otherwise tie up larger and more costly equipment.

Available in either flywheel or geared type, the standard press has a four inch stroke with up to 12 inch stroke available at extra cost. Ram area is 11¼ x 24 inches standard, with up to 11¼ x 36 inches available.

Federal Press Co.
For more information, circle No. 249 on the Reader Service Card

END MILLS DESIGNED
. . . for milling aluminum

A complete line of standard end mills for milling aluminum has been introduced.

Included in this line are: 2, 3, 4, and 6 flute designs; square nose and ball nose types; shell end mills; standard and "Positiv-Lok" shanks; lengths from 2½ inches to 11 5/8 inches; and diameters from ¼ inch to six inches.

Putnam Tool Co.
For more information, circle No. 250 on the Reader Service Card

DRIVE HANDLE
. . . for fast assembly

A¼-inch drive handle employs a special button on top of the handle, which floating independently of the handle, allows the user to "spin" nuts or bolts in or out.

Called the "Spinmaster," the tool is powered by a cross bar which acts as a fly wheel. It also serves as a leverage point to either loosen or tighten nuts or bolts.

The unit is claimed to be the fastest man-powered drive handle made — even faster than a ratchet.

Hunter Tools
For more information, circle No. 251 on the Reader Service Card

DUST COLLECTOR HAS
. . . no outside exhaust

An air circulating type dust collector with an air capacity of 2,405 CFM requires no exhaust outlet.

Dust particles are separated from the air within the unit by a cyclone separator, and the dust is precipitated into a bin located in the base. Air is exhausted into a 3 x 7½-foot bag which filters out the finest dust particles and releases the dust-free air into the work area.

Designated Number 20C30, the unit has a dust storage capacity of six cubic feet.

Aget Mfg. Co.
For more information, circle No. 252 on the Reader Service Card

ILLUMINATED MAGNIFIER
. . . has built-in light

An illuminated magnifier is available in a range of models to accommodate a wide variety of inspection jobs. Called the "Flash-O-Lens," the units feature a built-in light source.

Portable models, using standard flashlight batteries, come with five and seven power fixed-focus, non-achromatic lenses. They can also be equipped with 20 and 40 power tubes to make a portable shop microscope.

Electric models, with the same lenses and accessories as the battery units, are equipped with a separate switch and plug into any AC or DC outlet for continuous use.

Abbeon Supply Co.
For more information, circle No. 253 on the Reader Service Card

CONTROL VALVES
. . . give wide adjustments

Improved fluid control valves for air, oil, or water hydraulic use have been designed for pressures of 200 to 5,000 psi in sizes from 1/8 through 3/4 inch.

Two types of valves are combined into one compact body design: a floating retro-ball check which provides full flow in one direction, and a tapered fine thread needle which gives a wide range of adjustment in the opposite or controlled direction.

Valve bodies are machined from hexagon bar of brass and aluminum for 2,000 psi working pressures, and of steel and stainless steel for 5,000 psi working pressures.

Modrich Fluid Controls, Inc.
For more information, circle No. 254 on the Reader Service Card

NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

NEW MPA LEADERS ANNOUNCED FOR 1957

AT the thirteenth annual meeting of the Metal Powder Association, officers and directors for the coming year were elected. In his remarks before the Association, Dr. George A. Roberts, of Vanadium-Alloys Steel Co. said ". . . . this meeting in Chicago marks the end of a year which saw the greatest advances in the use of metal powders and metal powder parts."

The new officers and directors of the Metal Powder Association are: Dr. George A. Roberts, president and chairman of the board; Christopher L. Snyder, first vice president; Carl G. Johnson, second vice president; E. H. Klein, chairman of the powder producers division; C. L. Snyder, chairman of the ferrites division; and D. L. Almquist, chairman of the iron powder core division. A chairman of the fabricators division is still to be elected. Kempton H. Roll was re-elected executive secretary and treasurer.

NEW DIRECTORS

Directors of the association for the coming year are: P. Ulf Gummeson, C. E. Hanson, J. K. Nyburg, C. Allen, G. J. Comstock, V. T. Price, T. L. Robinson, J. M. Copeland, B. I. Horton, R. C. Burgess, J. Mikitka, H. R. Delaney, D. L. Andrews, W. W. Garstang, R. D. Ponemon, S. Lowenberg, C. S. Batchelor, and E. J. Lewis.

PANEL TALKS ON FUTURE OF ZINC DIE CASTINGS

PROBING FUTURE PROBLEMS of the zinc industry, panel discussions were conducted. Representing users of zinc die castings were, at left, J. Gurski, Ford Motor Co.; and R. G. Thompson, General Electric Co. Offering views of zinc die-casting producers were, left to right in right-hand photo: E. S. McGlone, Anaconda; S. D. Strauss, AZI president; and C. M. Chapin Jr., St. Joseph Lead.

FUTURE problems of the zinc die casting industry were seriously and analytically discussed at special panel sessions held in connection with the recent American Zinc Institute meeting in New York City.

American Zinc Institute directors made up the membership of a special panel which met to hear and discuss suggestions and viewpoints, of producers and users of zinc die castings.

Outlined were various steps being taken at the present time by the American Zinc Institute to meet steadily increasing consumer demands for new and improved zinc products.

A study of new markets for zinc die castings can reveal new uses for the metal which have not been developed at the present time, the panel discovered.

Programs for future development of the industry itself were discussed. Recent advancements within the industry, in order to meet the competition of other, lower priced metals, were outlined and evaluated.

Results were positive suggestions and recommendations for future development of the zinc die casting industry.

STRAUSS NEW AZI PREXY

SIMON D. Strauss is newly elected president of the American Zinc Institute, according to an announcement by the board of directors. Strauss is vice president and manager of sales for the American Smelting and Refining Co. Other officers elected include: J. D. Bradley, Clarence Glass, and H. L. Young, vice presidents; E. V. Daveler, treasurer; and J. L. Kimberly, secretary and executive vice president of the group.

Continued on page 116

Factory Mutual Laboratories, Norwood, Mass.

Factory Mutual Laboratories test

SHELL IRUS FLUID 902

the low-cost, fire-resistant hydraulic fluid

Factory Mutual Laboratories, the well-known industrial testing authority, recently evaluated Shell Irus* Fluid 902.

The tests performed included:

1. **Flash Point**
2. **Autoignition**
3. **Flame Propagation**

The Shell Industrial Engineer can give you more information about these tests.

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In plant after plant, users find that Shell Irus Fluid 902 is comparable in fire resistance to much higher-priced hydraulic fluids.

SHELL OIL COMPANY

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100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

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INTERNATIONAL FAIR DISCUSSES SHELL MOLDING

Shell molding with resin-coated sand was the chief topic of discussion at some of the Liege International Fair foundry technical meetings.

Keynote speaker was Arthur Woods, European Manager for Shallway International Corporation, who stated that material and labor costs of shell molding compared to green sand molding had fallen "from a stand-off to a substantially lower cost for shell molding in most applications". He pointed out that whereas foundry costs had been about the same for shell molding and green sand molding in many applications, the cost of shell molds had fallen substantially with the introduction of mullers capable of converting sand and powdered resin into resin-coated sand.

HENRY PRESENT JOINS JELRUS

The appointment of Mr. Henry Present to the position of Director of Engineering and Metallurgy was announced by Louis E. Brooks, Vice President and General Manager of the Jelrus Precision Casting Corp. of New York City. Mr. Present is both a mechanical engineer and metallurgist and brings to the Jelrus organization 10 years of experience in the investment casting industry. He was formerly with Crucible Steel Co. of America and Arwood Precision Casting Corp. Mr. Present is a member of the American Society of Metals.

EUGENE J. WIENMANN TO ADDRESS SDE.

The June meeting of the Society of Die Casting Engineers, Inc. Chicago Chapter will have for Speaker Mr. Eugene J. Wienmann, Supt. of the Tool Room of Carter Carburetor, Div. of A.C.F., St. Louis, Mo.

The subject of Mr. Wiemann's talk "Let's Make Better Castings" will include points on how to reduce scrap, also non-inflammable hydraulic fluids.

ALFRED SUGAR LEAVES ALLOYS & CHEMICALS

Mr. Alfred Sugar announces that he will sever association with Alloys & Chemicals Mfg. Co., Inc. of Cleveland, effective May 1, of this year.

While with Alloys & Chemicals Mfg. Co., Inc., Mr. Sugar served

Federated products:

Aluminum, Babbitts, Brass, Die Casting Metals, Fluxes, Lead and Lead Products, Magnesium, Plating Materials, Solders, Type Metals, Zinc Dust

Quality in mass production requires quality control from mine to your shop

ASARCO quality control extends from crude ore to the finished zinc die castings made from Federated Di-Metal.

The zinc comes from ASARCO mines. It is refined in ASARCO plants to 99.99+% purity. Di-Metal is produced by the Federated Metals Division under rigid quality control procedures developed by ASARCO's Central Research Laboratory.

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Each Di-Metal ingot meets specifications exactly. It will perform as you expect it to.

Try Federated Die-Casting metals. It will pay you well.

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Division of

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as Vice-President and Technical Director. Although Mr. Sugar's exact plans for the future have not been revealed, it is certain that they will center around the technical and sales phases of the aluminum industry.

POWDER METALLURGY MEETING IN DUSSELDORF

A meeting of the Ausschuss fur Pulvermetallurgie (Gemeinschafts-ausschuss des Vereins Deutscher Eisenhuttenleute, Vereins Deutscher Ingenieure and der Deutschen Gesellschaft fur Metallkunde) will be held in Dusseldorf on 27th and 28th of June 1957.

Papers will be presented on the following subjects: grinding and pressing of metal powders; properties of powders and means of affecting them; some physical aspects of the sintering process; equilibrium diagrams of the systems niobium — niobium carbide — niobium nitride, vanadium — vanadium carbide—vanadium nitride, titanium carbide — tungsten carbide, and titanium carbide — tungsten carbide — cobalt; toughness and hardness testing of carbides; non-destructive testing of sintered components made from tungsten relative to foreign matters and cold deformation; production and properties of sintered components of iron, stainless steel, molybdenum and copper.

Further information and invitations may be obtained from the Geschaftsfuhrung des Ausschusses fur Pulvermetallurgie, Dusseldorf, Breite Strasse 27.

M. C. PLUMMER TO HEAD HYDRAULIC PYDRAUL SALES

Morgan C. Plummer of St. Louis has been appointed to the newly-created position of supervisor of Pydraul sales for Monsanto Chemical Company's Organic Chemicals Division.

Plummer has been sales engineer in the functional fluids section of the division's petroleum chemicals sales group since May, of 1955.

He joined Monsanto in 1943 and served as a laboratory technician and chemical engineer at the company's William G. Krummrich Plant at Monsanto, Ill., until 1948. He rejoined Monsanto in February, 1951, and transferred to sales in 1954.

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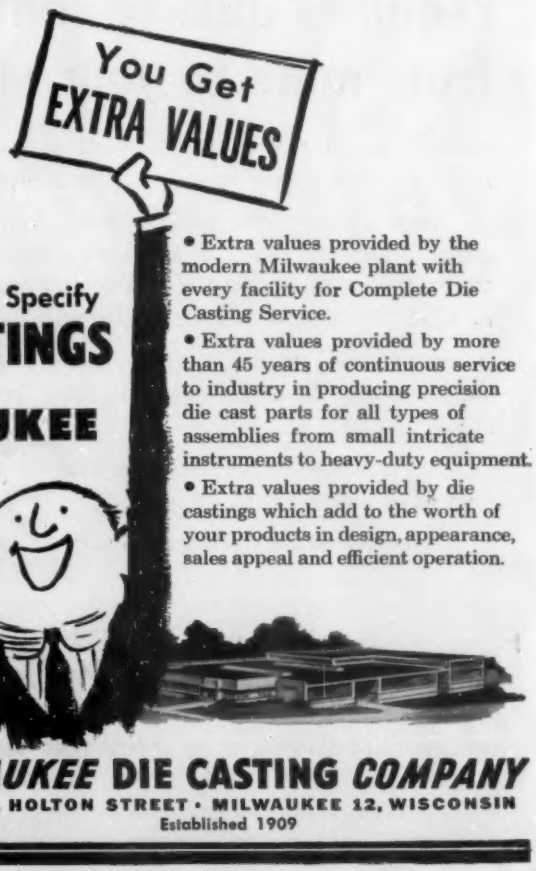
DIE CASTERS ELECT CLIFFORD L. ANTHONY

Clifford L. Anthony, Works Manager of The Hoover Company, North Canton, Ohio was elected Vice President of the American Die Casting Institute at a meeting of the Board of Directors held recently. Mr. Anthony will complete the vice-presidential term of J. Sheehan, Aluminum Company of America, who was elevated to the Presidency of the Institute several months ago.

"Cliff" Anthony brings to his new office a well rounded background in the custom die casting field. A graduate engineer of the Case Institute of Technology, Mr. Anthony came to The Hoover Company in 1943 as a foreman in the Inspection Division. He was made a General Foreman the following year and advanced rapidly to the Industrial Engineering Department of the Production Division. Before Mr. Anthony took over his present position as Works Manager in 1954, he had also served as Manager of the company's Commercial Die Casting Sales Division and, later, as Executive Assistant in charge of government contracts, defense work and the Commercial Die Casting Division.

Mr. Anthony has been an active participant in all programs of the American Die Casting Institute where he has utilized his background on both the Metallurgical and Finance Committee. For the past two years he has been a member of the National Board of Directors and Vice Chairman of the Institute's Central Regional Group.

Clifford L. Anthony



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- Extra values provided by the modern Milwaukee plant with every facility for Complete Die Casting Service.
- Extra values provided by more than 45 years of continuous service to industry in producing precision die cast parts for all types of assemblies from small intricate instruments to heavy-duty equipment.
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Milwaukee operates under the Certified Zinc Plan of the American Die Casting Institute.

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PRINTZ JOINS REPUBLIC STEEL

An expanded sales and customer metallurigical services program by Republic Steel Corporation's Metal Powder Division was announced recently by James K. Nyburg, manager of sales.

Nyburg said that Leon J. Printz, who has had 24 years' experience in powdered metal metallurgy, has been appointed to assist him in the new program.

"The whole powder metal field is expanding," Nyburg said, "as

James K. Nyburg

more and more users discover it is the fast and economical answer to the problems of production of intricately shaped metal parts.

Republic is producing three different types of iron powder that give predictable dimensional characteristics after sintering opera-

Leon J. Printz

tions. Republic's exclusive Controlled Dimensional Factor, developed by Republic metallurgists, make these powdered metals ideal in many applications," Nuburg said.

Until his Republic appointment, Printz was chief metallurgist for research and development of powdered metals for the Amplex Division of Chrysler Corporation.

B&T MACHINERY APPOINTS L. R. MAY

Lawrence R. May, formerly General Manager of Cast Master, Inc. of Cleveland, Ohio, has been named Vice President and General Manager of the B&T Machinery Co. of Holland, Michigan, according to Jay H. Petter, President of B&T.

The B&T Machinery Company manufactures and distributes nationally, a complete line of machines for die casting zinc and aluminum in capacities ranging from 100 to 750 tons.

Lawrence R. May

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HYDRAULIC and MECHANICAL
BRIQUETTING PRESSES BY –
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For more information circle No. 5 on the Reader Service Card

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- SUPER-CORROSION RESISTANCE
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- HIGH IMPACT STRENGTH
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producers of prealloyed metal powders and pigments

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GRC's unique, patented method die casts multiple-part zinc-alloy units INTERCAST with moving elements in a single, automatic, time-saving, money-saving operation . . . even continuously interlocked assemblies. Units are delivered ready for use.

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STANDARDS

continued from page 40

involve extra time and cost which are justified only for a relatively small percentage of die castings. For all these reasons, it is generally recognized that these methods may serve as a basis for rejection of die castings *only* when the die caster and purchaser have specifically agreed to the use and criteria involved.

Patents

The die caster is *not* responsible for the design of the customer's product or device, or for the design of the die casting *as a part* of such product or device. The purchaser of die castings is liable for his own product or device and for all patent infringement claims relating to it or any of its parts.

Die casting is essentially a conversion process by which metal shapes are produced. Therefore, if a die casting infringes, or is claimed to infringe, any letters patent or copyright, the purchaser must assume the responsibility involved.

Die casting proposal and acknowledgment forms generally include clauses which provide that the die caster shall be indemnified and held harmless of and from all expenses arising from all such claims.

VACUUM METALS EXPANDS

Crucible Steel Company of America announced a $1,500,000 expansion program for Vacuum Metals Corporation, an operating division of the Company's Sanderson-Halcomb Works at Syracuse, N. Y. The program will double the Company's capacity for producing high purity vacuum-melted materials.

Joel Hunter, President, said the expansion is being undertaken to meet increased demand for vacuum-melted high quality bearing and high temperature alloy steels. He said construction is expected to be completed before the end of this year.

Included in the expansion program are: A new vacuum induction furnace, expected to be the nation's largest, capable of producing 3,000 pound ingots. A new melt shop building which will house the furnace, and also have adequate space for expansion. A new metallurgical-chemical laboratory building for production.

POWDER METAL PARTS ASSOCIATION FORMED

A new trade association in the powder metallurgy field has recently been formed. This new group, properly known as the Powder Metallurgy Parts Manufacturers Association, is composed exclusively of jobbing fabricator companies as regular members and in-plant fabricators as associate members.

Officers of the association are: K. Gleszer, pres.; W. R. Toeplitz, vice pres.; G. L. Bachner, secretary-treasurer. Directors are: W. R. Toeplitz, Colonel G. W. Trichel, K. Gleszer, G. L. Bachner, G. G. Fellows, J. E. Miller, S. Bolton, J. Helsel, and M. T. Victor.

The articles of incorporation of the association give as the aims of the corporation: 1. To promote wider usage and improve the quality of powdered metal products; 2. To promote standardization of powder metallurgy products including composition, physical properties of finished units and testing methods; 3. In cooperation with manufacturers of metal powders, to develop industry-wide standards and testing methods for raw materials used in the industry; 4. To establish a statistical department for the collection of information relating to the industry and dissemination of such information to members of the industry, its customers and suppliers, the government and the public; 5. To appear for the members of the association before, and to cooperate with, governmental departments and agencies with regard to matters affecting the industry; and 6. To disseminate technical knowledge of the powder metallurgy process to engineering institutions, associations and the public.

Speaking about the new group, G. L. Bachner, secretary said, "I would like to point out that we are most confident of rendering the Industry a major service with this new association. I further feel that by cooperative actions with the M.P.A., many programs which will benefit the Industry will materialize and be completed in the near future."

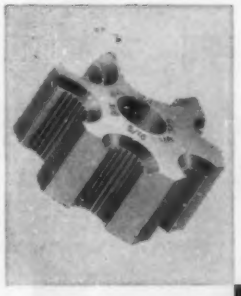
Membership in the new trade organization is twenty contract fabricating companies and one in-plant fabricator. It is the hope of the founding companies that as the scope and activities of the association broadens all of the remaining fabricators will become active or associate members.

GIVING YOU

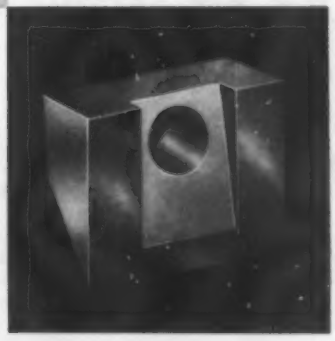
...the best and most modern!

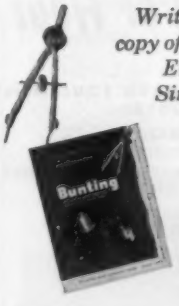
Bunting today covers a new area in the engineering and manufacture of bearings and machine parts. To the traditional line of Bunting Cast Bronze Bearings and parts is added up-to-date, soundly established facilities for engineering and manufacturing bearings and parts made of Sintered Powdered Metals.

In an entirely new plant with the very latest equipment, Bunting now attains the position in the Sintered Powdered Metals field which it has long held in the field of Cast Bronze Bearings.



A competent group of Bunting Sales Engineers in the field and a fully staffed Product Engineering Department put at your command, comprehensive data and facts based on wide experience in the designing and use of Cast Bronze and Sintered Powdered Metal Bearings and parts.





Write for catalogs and your copy of the new 24 page Bunting Engineering handbook of Sintered Powdered products and their composition, manufacture and application.

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OPPORTUNITIES

jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding, 812 Huron Rd., Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

POSITIONS WANTED

ASSISTANT SALES MANAGER — experienced in investment casting sales, estimating, quota determination, representative selection and advertising. Young graduate engineer seeks greater managerial responsibility. Write Box No. 6457.

POSITION WANTED — Experienced plant superintendent or general foreman. Builders hardware in all foundry departments. Brass and bronze and aluminum almag. In all die casting departments and finishings. 24 years experience — age 45. Write Box No. 5157.

POSITIONS OPEN

WANTED — Sales representative — by progressive West Coast precision investment casting company producing ferrous and nonferrous castings. Choice territory open for qualified sales personnel. Commission basis. Address all correspondence to Box No. 6357.

DIE CASTING ENGINEER — Assistant manager of brand new growing zinc and aluminum die casting plant in New Jersey near resort and recreational areas. An unusual opportunity for an ambitious man experienced in die making and die casting to develop his own future. Write Box No. 6557.

SALES REPRESENTATIVE — Ferrous and non-ferrous investment castings. Must be an engineer well versed in the application of castings as well as machine shop practices. Expanded modern facilities provides great potential in several territories still open. Give full particulars in strict confidence. Jelrus Precision Casting Corp., 615 West 131st Street, New York 27, N. Y.

MIDWEST DEALERSHIP — open for small diecasting machines — State territory covered, number of salesmen and existing lines sold. Write Box No. 6257.

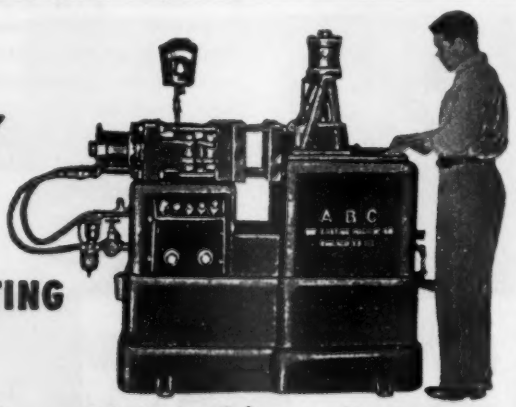
EQUIPMENT

FOR SALE — Lester Phoenix Model 35 Type HHP2 die casting machine, cap. 6½ lbs. zinc, 100 ton, 18" x 20" die size, 9" opening. Cpl. with melting pot, hyd. pump, valves, controls. Aaron Machinery Co., Inc., 45 Crosby St., New York 10, N. Y. Walker 5-8300.

FOR SALE — 1 Kux #K5 Die Casting Machine, 25 ton locking pressure, 6" x 13" between bars, for zinc or lead. 1 Kux #BH-12 Die Casting Machine, 80 ton locking pressure, 12¼" x 12¼" between bars, for zinc or lead. 1 Madison-Kipp #A-15 Die Casting Machine, for 6" x 6" dies, for zinc or lead. 1 Air Gooseneck die Casting Machine, 14" x 24" between bars, for zinc, lead, or aluminum. 1 Compressor, 550 lb. High Pressure, 10/4¼ x 10 Ingersoll Rand, 60 HP-3/60/220V - 1200 RPM. Being replaced with new equipment. Advance Pressure Castings, Inc. 20 Wythe Avenue, Brooklyn, New York—Mr. J. Golucci EV 9-4890.

NEW!

HIGH SPEED A.B.C. DIE CASTING MACHINE



Free Cycles Over 1000 Shots Per Hour

Here's the new A·B·C high speed, low cost die casting machine which eliminates costly production of small die castings on large die casting machines. Air operated, the machine produces small non-porous lead, tin and zinc alloy precision die castings up to 1½ lbs.

The A·B·C is economical to operate and easy to set up. Its lightning production speeds makes single cavity molds practical and profitable.

STANDARD EQUIPMENT INCLUDES:

- 4 TIE BARS
- AUTOMATIC TIMING
- CALIBRATED TEMPERATURE GAS CONTROL
- GAS BURNERS
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A B C DIE CASTING MACHINE CO.
400 E. 142nd ST. • DOLTON, ILL.

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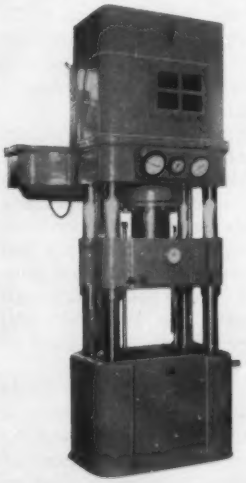
150 TON HPM

Hydro-power fast traverse press with 15 ton auxiliary actions in platen and bed.



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AD. LIT.—cont.

72. Investment Materials — Investment materials that are said to produce better castings with finer detail and smoother finish are described in technical information from Pre-Vest, Inc. Samples are also available.

75. Iron Powders — Information from Republic Steel describes their three grades of iron powders. The powders' "CDF" feature is explained.

76. Heat Transfer — Bulletin 1.1K5 from Ross Heat Exchanger div. of American-Standard gives detailed information on pre-engineered and fully standardized heat exchangers.

77. Vacuum Die Casting — Complete information is available from Reed-Prentice Corp. on their "Vacucast" system as either original equipment or conversion units.

79. Investment Castings — Facilities for increased dividends on investment castings are described in information from Scott Castings Div. of Rolle Mfg. Co.

86. Tool Steel Alloys — Specification charts and technical aids are offered by WaiMet Alloys Co. to aid in the selection of tool steel and stainless steel alloys.

87. Pilot Plant Facilities — A new booklet issued by Westinghouse Electric Corp., entitled "For A Competitive Edge," describes their new metals plant at Blairsville, Pa. and explains pilot plant facilities for exploring production conditions and creating prototype quantities for wrought alloys and molded metal products.

88. Wax Shapes — A complete catalog from Yates Dental Mfg. Co. describes their complete stock of wax shapes.

91. Finishing Non-Ferrous Metals — Detailed laboratory and engineering reports on finishing non-ferrous metals by "Iridite" process are available from Allied Research Products, Inc.

92. Finishing Costs, Processes — A 52-page book published by Almco Div. of Queen Stove Works, Inc. gives information on barrel finishing processes. Included is a detailed cost chart on the finishing of typical parts.

93. Zinc Plate Coating — Data sheets and prices are available from The Chemical Corp. on their new "Luster-on 52" single-dip, no leach conversion coating for zinc plated surfaces.

Continued on page 126

2
1
3
Thousands of these miniature XK120 Jaguars (1) are molded each hour from multiple steel cavities (2). These hobbings are produced rapidly and with a minimum of machining from a single master hob (3).

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NEWARK DIE HOBBED CAVITIES

To speed up tooling and cut costly machining, filing and polishing time . . . many plants choose die hobbing. One master hob provides any quantity of steel molds or dies, all of them exactly alike and each requiring a minimum of hand or machine finishing. Because hobbing is a cold flow, high pressure operation (over 100 tons per sq. in.) each cavity acquires a closer surface grain structure. This assures faithful retention of the finest detail . . . plus a luster that would be difficult to accomplish by machine finishing.

Now producing cast cavities by the Shaw Process

WRITE for your free copy of "How and When to Hob." Or let us discuss directly how Newark's complete die hobbing facilities and experience with all sizes and types of cavities may benefit you. No obligation, of course.

NEWARK DIE HOBBING AND CASTING CO.

INVESTMENT CASTING INSTITUTE SPRING SESSION MEETS IN WASHINGTON, D. C.

SPRING meeting of the Investment Casting Institute was held May of the Fluid Flow of Light Alloys Hotel in Washington, D. C.

Members saw a color film, "Study of Fluid Flow of Light Alloys Through Vertical Gating Stems", which was sponsored by the American Foundrymen's Society.

Among the speakers were: Dr. Nicholas Grant, of the Massachusetts Institute of Technology, who delivered a "Comment on High Temperature alloys"; Hugo Larson, who described "Physical Properties of Cast Aircraft Steels"; S. K. Hodgson, who spoke on "Design and Use of Investment Castings in Airframes; and Dr. Charles Marsel, of the Department of Chemical Engineering, New York University, who described "Engineering Properties of Pattern Waxes."

"Progress in Government Research on Castings" was reported by John H. Garrett, Executive Sec. Coordinating Committee on Materials, the Office of Assistant Sec. of Defense, in Washington, D. C. Garrett offered a detailed review of principles in his outline of progress.

Other speakers and their topics were: R. R. Miller, "Presentation of the Investment Casting Engineering and Design Manual"; R. J. Metzler, "Statistical Sales Forecasting"; F. L. Romeo, "How the Investment Casting Industry Can Capitalize on Cost Reduction Programs"; K. W. Thompson, "Some Possible Approaches to Investment Casting Research"; R. W. Tindula told of types of "Technical Information Available from the Government"; Ted Operhall, outlined "The M.I.T. Investment Casting Course"; and G. W. Paget, "Production Control in Operation".

Harrison Wood, featured speaker at the luncheon session, talked on "The Changing World".

Technical sessions of the Spring Meeting were held the first day, business sessions on the second.

DIE CASTERS . . . *Here's Added Savings!*

D-M-E CAVITY SETS
IN 6 NEW STANDARD SIZES

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$14^{7}/_{8}$" x $23^{3}/_{4}$"
$16^{1}/_{2}$" x $23^{3}/_{4}$"
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$23^{3}/_{4}$" x $35^{1}/_{2}$"

STANDARD PLATE THICKNESSES FROM $^{7}/_{8}$" to $5^{7}/_{8}$"

ALL PLATES GROUND FLAT and SQUARE
Ready for your die layout and cavity inserts

Precision Ground LEADER PINS and BUSHINGS
For accurate alignment and longer wear

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D-M-E's 12 page Brochure giving
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AMERICAN PROGRESS IN PRECISION CASTING OUTLINED TO EUROPEANS

PARIS — American achievements in the precision casting field are already influencing European moves toward modernization and advancement of the industry.

Adding to this influence and telling the story of America's own precision casting progress, four outstanding men represented their firms and spoke before members of the Second International Die Casting Conference in the French Capital.

Of special interest to die casters whose firms are located in Europe was the extensive exhibition of American made die castings. Many American companies contributed their most interesting, and most outstanding work-samples.

The assembled exhibit was introduced to conference members and visitors by C. R. Maxon of the New Jersey Zinc Company. The American exhibit, and a French exhibit remained open to the public throughout the conference.

Addressing members at the conference's first session was a second American with a wide experience in the precision casting field. C. L. Anthony, president of the American Die Casting Institute described "The Function of the American Die Casting Institute in an expanding Die Casting Industry".

Sixth session members of the conference heard from a third American, a man able to speak with a great deal of authority on die castings and their advantages. G. Nyselius, president of the Mount Vernon Die Casting Corp., discussed details of "The Unit Die System".

Fourth, and one of the most able Americans to address the

conference, was Fred Bauer, Assistant general manager and chief engineer of the Doehler Jarvis Corp.

Bauer talked about one of the subjects most interesting to any business man, whether he is European, or American. His topic was "Cost Analysis for Die Casting".

Several tours were planned for attending members and delegates. Among these was a visit to Renault automobile factory, and trips to the Fonderie de Precision, and the Laborator of the Laboratory of the Centre Technique des Industries de la Fonderie.

ALLIED RESEARCH APPOINTS TWO NEW REPRESENTATIVES

Allied Research Products, Inc., Baltimore manufacturer of the Iridite chromate conversion coatings and ARP plating chemicals, has announced the addition of two new representatives to its sales organization.

Mr. Robert S. Sweeney will cover central Michigan and northwestern Ohio, Mr. Chester J. Bogin will cover northern Chicago and the northern Illinois counties.

PRESENTING

ALUMINUM
Alloy
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STROH'S experience in producing zinc alloy die castings since 1903 is now being applied to making ALUMINUM DIE CASTINGS of the same outstanding Quality. We can give you precisely **what** you want **when** you want it and will welcome your inquiry.

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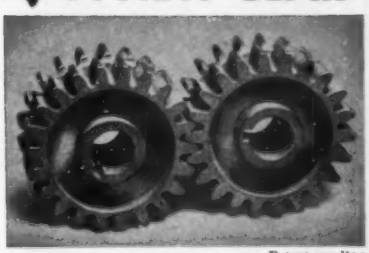
A NEW GEAR



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Get strength equal to or better than you would get with larger gears having standard teeth. Take advantage of their quiet, smooth operation.

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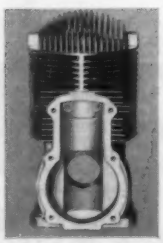
DIE CASTING REPORT

Streamlined—lightweight and rugged—thanks to advanced designing and use of die casting

4 cylinder sizes from one die!

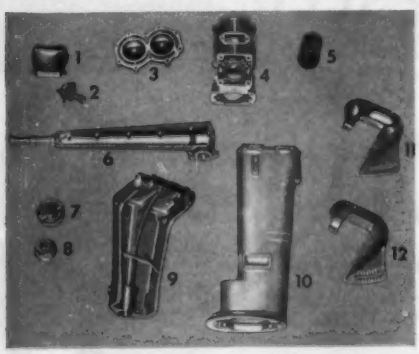
Interchangeable cores in a master die enable Precision to produce 4 different sized aluminum cylinder blocks for West Bend.



This year America's waters are being churned by a steadily growing outboard motor population. New companies entering this field have had to meet stiff competition from the "old line" producers. How have they done it?

The West Bend Aluminum Company, of West Bend, Wisconsin, is a good example. Their Hartford Division is currently putting on the market a line of high performance outboard motors ranging from 2 to 25 H.P. One of the most important factors in cutting down on excess bulk and weight has been the strategic use of aluminum die castings. Cooperative planning on die-cast design of components helped achieve compactness, streamlined appearance and light weight. All this without sacrificing strength where needed.

For production and assembly savings, it will pay *you* to investigate the use of die-castings. Let the Precision team of experienced die design engineers look at your problem. The result! Savings on machining, assembly and unit cost!



Typical Aluminum Outboard Motor Parts

1. Transfer port cover
2. Gas pump cover
3. Cylinder head
4. Cylinder block
5. Steel bushing insert
6. Steering handle
7. Bearing cage
8. Slip clutch plate adapter
9. Swivel bracket
10. Drive shaft casing
11. Stern bracket
12. Stern bracket

Write on your letterhead for free copy of "DIE CASTINGS... UNLIMITED" Precision Castings Co., 42 Warren St., Fayetteville, N. Y.

PRECISION CASTINGS CO.

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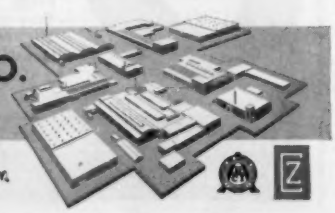

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N-R CORP. TO MAKE FEED MATERIAL FOR STEEL INDUSTRY

Republic Steel Corporation and National Lead Company have announced the formation of R-N Corporation. The new organization, owned jointly by the two companies, has developed a direct reduction process for the treatment of both low-grade and high-grade iron ores, which will provide the steel industry with high metallic iron feed materials for use in blast furnaces, electric, open hearth and cupola furnaces. Major steel companies have evidenced considerable interest in the process.

AD. LIT.—cont.

14. Ethel Silicate — Complete product information is offered by Anderson Chemical Co. on ethel silicate for investment casting.

95. Trimming Presses — Complete information is available from Clearing Machine Corp. on mechanical and hydraulic presses for trimming die castings.

98. Plating Barrels — Twelve new Mercil-type belt-driven plating barrels are described in a catalog from Hanson-Van Winkle-Munning Co.

101. Small Parts Drying — A four-page folder on centrifugal air drying of small parts has been issued by New Holland Machine Co.

103. Precision Barrel Finishing — is the title of a new booklet issued by Oakite Products, Inc. It contains valuable information on cutting down, deburring, descaling, and burnishing.

104. Magnesium Dust Control — The "wet method" of magnesium dust collection and control is the best, according to a brochure from Peters-Dalton, Inc.

105. Aluminum Conversion Coating — Technical details are available from Turco Products, Inc. on "Turcoat 4178," an aluminum surface conversion coating formulated to stop aluminum corrosion, insure paint adhesion, give ornamental finish to non-ferrous castings.

109. Industrial Investments — A complete catalog from Kerr Mfg. Co. describes a full line of investments for both ferrous and non-ferrous casting.

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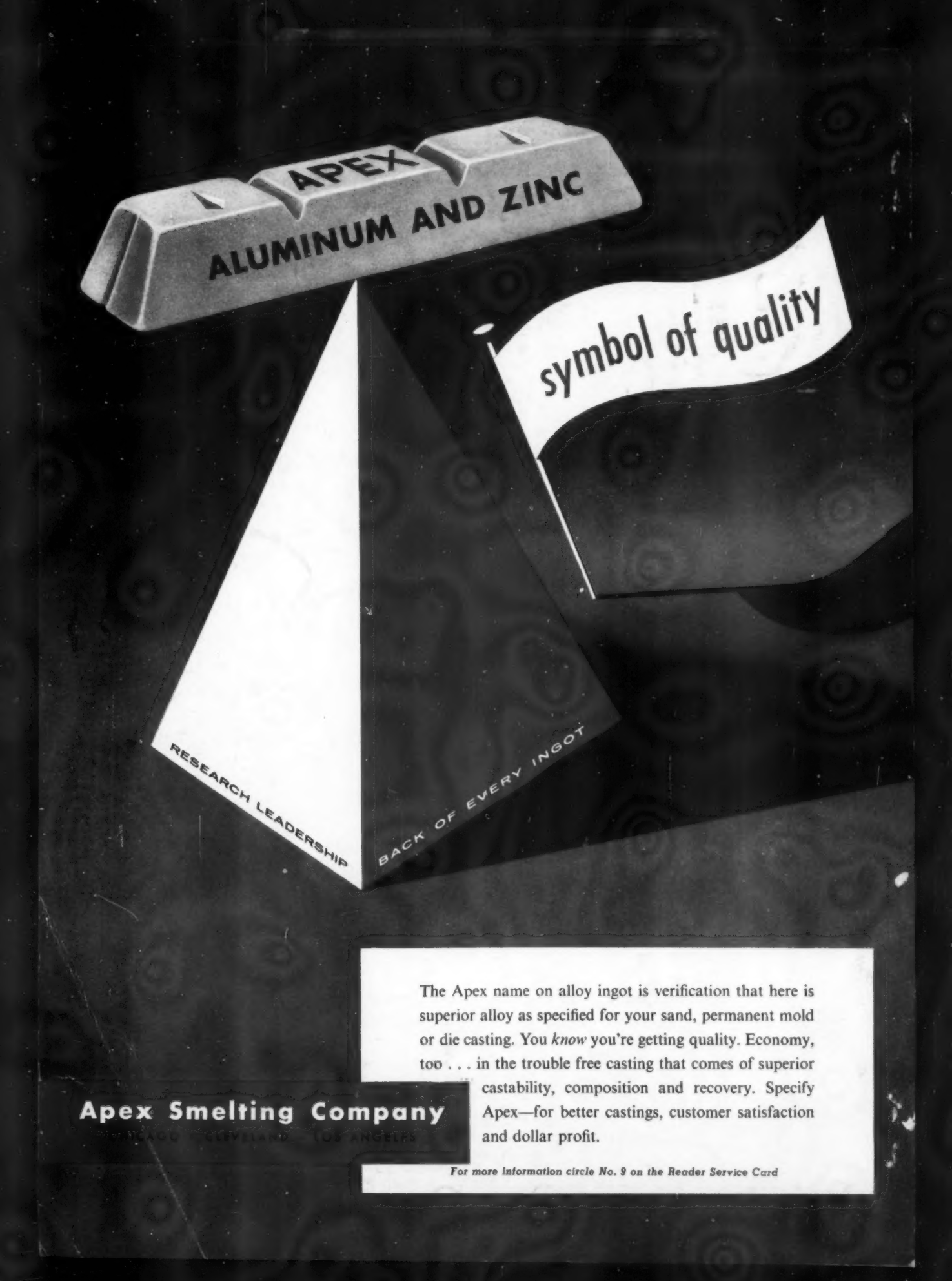

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